BEST AVAILABLE IMAGES

Defective images within this document are accurate representation of The original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 :
A47C 1/023

A1

(11) International Publication Number: WO 99/63866

(43) International Publication Date: 16 December 1999 (16.12.99)

(21) International Application Number: PCT/CA99/00492

(22) International Filing Date: 4 June 1999 (04.06.99)

(30) Priority Data:
09/092,755 5 June 1998 (05.06.98) US
09/257,444 25 February 1999 (25.02.99) US

(63) Related by Continuation (CON) or Continuation-in-Part (CIP) to Earlier Application
US 09/257,444 (CIP)
Filed on 25 February 1999 (25.02.99)

(71) Applicant *(for all designated States except US)*: TEKNION FURNITURE SYSTEMS [CA/CA]; 1150 Flint Road, Downsview, Ontario M3J 2J5 (CA).

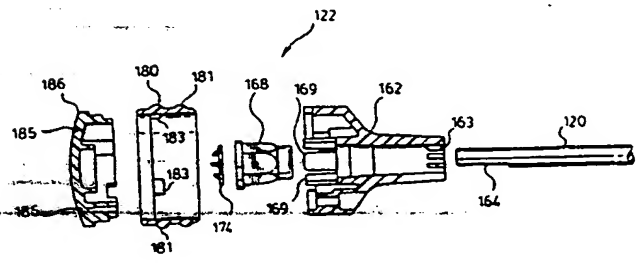
(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: CHU, Zooey [US/US]; 560 Fifth Street, North West, Grand Rapids, Michigan, MI 49504 (US). WURL, Harald [DE/DE]; 12 Lilienweg, D–91077 Kleinsendelbach (DE). BOCK, Hermann [DE/DE]; 8 Jagdstrasse, D–90602 Pyrbaum (DE).

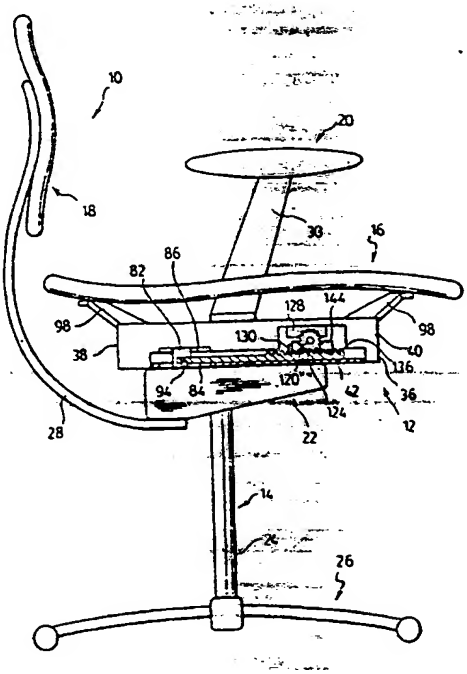
(74) Agent: SCHISLER, Mark; Bereskin & Parr, 40th floor, 40 King Street West, Toronto, Ontario M5H 3Y2 (CA).

(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: CLUTCH FOR A SEAT ADJUSTMENT MECHANISM





(57) Abstract

A clutch for a chair having a seat (16) slidably mounted on a base and adjustable by an adjustment member (44) drivingly connected to the seat is provided. The clutch selectively disengages the adjustment member from the seat when a predetermined force is applied to the adjustment member.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon			PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

Title: CLUTCH FOR A SEAT ADJUSTMENT MECHANISM

FIELD OF THE INVENTION

This invention relates to an adjustment mechanism for a seat. In particular, this invention relates to an adjustment mechanism whereby the seat of a chair or the like may be moved longitudinally forward or rearward with respect to the support on which the seat of the chair is positioned.

BACKGROUND OF THE INVENTION

Rhyner (United States Patent No. 1,693,120), Kimura (United States Patent No. 4,648,646) and Tamura et al (United States Patent No. 4,796,591) each disclose the use of a rack and pinion to adjust the position of a car seat. Rhyner discloses an adjustment mechanism comprising a hand wheel mounted on a shaft on which pinions are provided. Racks are provided on opposed sides of the bottom of the seat. Upon turning the hand wheel, the pinions rotate causing the cat seat, to which the rack is mounted, to move forwardly or rearwardly. This design is disadvantageous for use with an office chair or the like as it uses two widely spaced apart racks to provide transverse stability to the seat.

Kimura and Timura et al each also disclose the use of spaced apart racks. In addition, these references disclose multiple support and linking members between the seat and the floor of the car. The mechanism discloses a plurality of parts which are complicated to manufacture and are not suitable for use with an office chair or the like.

Ambasz (Canadian Patent No. 1,076,944) discloses a chair which operates on the principle of independent forward and backward movement of the seat and tilting of the back such that a chair may automatically adopt a configuration that will provide excellent anatomical support to a person seated in the chair. To this end, Ambasz discloses a seat which has on its underside, adjacent to the

centre and removed from the sides, a pair of elongated sleeves of uniform internal cross-section which extend lengthwise. The sleeves are in telescoping and sliding relation on seat support such that the seat is slidable forwardly and rearwardly. The seat is spring-loaded toward the rearward most position. Accordingly, one disadvantage of this design is that it does not permit the operator to fix the seat in a pre-set position with respect to the chair back.

Matthews et al (United States Patent No. 5,035,466) discloses an ergonomic chair wherein the seat support member is movable between a forward seated position and a rearward seated position. The mounting means for the seat includes a channel having a generally dovetail shaped configuration and a runner having a mating of dovetail shaped configuration that slidable engages the channel. As with Ambasz, the mounting means also includes means for biasing the seat support member toward the rearward position. Thus, the user may selectively apply force while seated in the chair to adjust and retain the position of the seat support member in a desired position between the rearward and forward position of the seat. Upon standing, the user removes the external force from the seat and the contraction force of the biasing means (i.e. A spring) will urge the runner back towards its original rearward seated position. Thus, one disadvantage of Matthews et al is that the chair will not maintain itself in a pre-selected position while the user stands.

Olsen et al (United States Patent No. 5,542,743) discloses a chair in which the seat member is movable with respect to the back-rest of the chair. The adjustment mechanism comprises a pair of parallel spaced tubular members telescopically received in the control bracket. The seat may be fixed in position by a clamping bar which clamps the tubular members to the control bracket. Accordingly, one disadvantage of this design is that, when the clamp is removed, there is no restriction on the movement of this seat with respect to the chair

back. Accordingly, the seat would become free floating.

Accordingly, previous disclosures have shown seat adjustment mechanisms for chairs which do not provide adequate controlled adjustment of the position of the seat with respect of the seat support. In addition, prior designs have incorporated constructions which are difficult to employ and/or which are complicated to construct.

SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided a chair comprising a longitudinally extending seat having a centrally positioned longitudinally extending axis defining a centre line; a support member for supporting the seat at an elevated height; a slide member fixedly mounted to one of the seat and the support member and having at least one drive portion; a slide mount positioned between the seat and the support member and fixedly mounted to the other of the seat and the support member, the slide mount slideably receiving the slide member, the slide member mounted for longitudinal movement forward and rearward with respect to the slide mount; an adjustment member drivingly connected to the at least one drive portion; and, a disengagment member to selectively disengage the adjustment member from the slide member when a predetermined force is applied to the adjustment member.

In accordance with the present invention, there is also provided a clutch for a chair having a seat slidably mounted on a base and adjustable by an adjustment member drivingly connected to the seat, the clutch comprising a drive shaft having a first end and a second end, the second end drivingly connected to the seat; a control knob positioned on the first end of the drive shaft; and, a disengagment member to selectively disengage the adjustment

member from the seat when a predetermined force is applied to the adjustment member.

In one embodiment, the adjustment member comprises a drive shaft having a first end and a second end, the first end having a control knob and the second end drivingly connected to the at least one drive portion.

In another embodiment, the control knob is rotatably mounted about the drive shaft and the disengagement member comprises a first engagement member associated with the drive shaft and a second engagement member associated with the control knob, one of the first and second engagement members being biased to engage the other of the first and second engagement members and drivingly rotatably connect the control knob to the drive shaft whereby the first and second engagement members disengage when the predetermined force is applied to permit the control knob to rotate independent of the rotation of the drive shaft.

In another embodiment, one of the first and second engagement members is resiliently deformable to bias it to engage the other of the first and second engagement members.

In another embodiment, the first and second engagement members include abutment surfaces and one of the first and second engagement members defines an opening in which the other of the first and second engagement members is received.

In another embodiment, the second engagement member comprises a slip member which is non-rotatably mounted on the drive shaft.

In another embodiment, the slip member has abutment surfaces provided on its outer surface and the first engagement member comprises a plurality of members which define an opening in which the slip member is received, the plurality of members contacting the abutment surfaces and being deformable outwardly

from the opening to permit the control knob to rotate when the predetermined force is applied.

In another embodiment, the adjustment member includes a slideable portion which is moveable between a first position in which movement of the adjustment member adjusts the position of the seat and a second position in which the seat is fixed in position.

In another embodiment, the chair further comprises a lock mechanism having a locked position in which the adjustment member is fixed in position and an unlocked position in which the movement of the adjustment member adjusts the position of the seat.

In another embodiment, the locking mechanism comprises a biasing member to bias the locking member in the locked position.

In another embodiment, the locking mechanism comprises a first engagement member connected to the slide mount and a second engagement member connected to the adjustment member and engagement of the first and second engagement members defines the locked position.

One advantage of the instant invention is that it provides a clutch for a seat adjustment mechanism which is simple to construct and, at the same time, is also reliable. Further, it is of a relatively compact size which is well adapted to be fitted control knob for the seat adjustment mechanism.

A further advantage of the instant invention is that the position of the seat may be easily adjusted by turning the adjustment member while a user is seated in the chair. This ease of use is further facilitated by incorporating the locking mechanism as part of the adjustment member. In the preferred embodiment, the adjustment member is moved between the locked position and the in-use (unlocked) position by the user, while seated in the chair, pushing transversely inwardly on the adjustment member. The user may then

rotate the adjustment member clockwise or counter-clockwise to adjust the position of the seat while they are still seated in the chair. Accordingly, the user requires the use of only one hand and may operate the adjustment member while still comfortably seated in the chair.

A further advantage of the instant invention is that if the seat is at the end of its travel path and the user tries to turn the control knob to further move the seat past the end of its travel path, or if the seat is locked in position and the user tries to turn the control knob without deactivating the lock, the clutch will allow the control knob to rotate and thus prevent the rotational torque applied to the control knob by the user from damaging the slide mechanism. Accordingly, drive components of the slide mechanism, eg. the teeth of the rack and the pinion, may be made of weaker materials, eg. plastic thus simplifying the manufacture of the slide mechanism.

DESCRIPTION OF THE DRAWINGS

These and other advantages of the instant invention will be more fully and completely understood in association with the following description of the preferred embodiment of the invention in which:

Figure 1 is a side elevation view of a chair according to the instant invention with the seat adjustment mechanism shown in cross-section along the line 1 -1 in Figure 6;

Figure 2 is a plan view of the interior surface of the cover plate of the housing of the slide mechanism shown in Figure 1;

Figure 3 is a cross section of the cover plate along the line 3 - 3 in Figure 2;

Figure 4 is cross section of the cover plate along the line 4 - 4 in Figure 2;

Figure 5 is a plan view of the interior of the seat support of

the seat adjustment mechanism shown in Figure 1 with the adjustment member mounted therein;

Figure 6 is a plan view of the interior of the seat support of the seat adjustment mechanism shown in Figure 1 with the adjustment member and the slide member positioned therein;

Figure 7 is a cross section of the seat adjustment mechanism along the lines 7 - 7 in Figure 6.

Figure 8 is a top plan view of the slide member of Figure 7;

Figure 9 is a side view of the slide member of Figure 8 shown in the direction of arrow A of Figure 7;

Figure 10 is a bottom plan view of the slide member of Figure 6;

Figure 11 is a side view of an alternate seat support according to the instant invention;

Figure 12 is a partially exploded bottom view of a portion of a chair showing an alternative embodiment of the drive mechanism for the slide member;

Figure 13 is an partially exploded view of the components of the alternative embodiment of the drive mechanism of Figure 12 with tilt mechanism;

Figure 14 is a top plan view illustrating the pinion of Figure 12 in locked mode;

Figure 15 is a top plan view illustrating the pinion of Figure 12 in unlocked position;

Figure 16 is a partially cutaway isomorphic view of a portion of a chair containing the drive mechanism of Figure 12;

Figure 17 is a partially cutaway plan view of a chair containing the drive mechanism of Figure 12 with the seat in the rearmost position;

Figure 18 is a partially cutaway side view of a chair containing the drive mechanism of Figure 12 with the seat in an

intermediate position;

Figure 19 is a partially cutaway bottom plan view of a chair containing the drive mechanism of Figure 12 in a position for the seat to be adjusted longitudinally;

Figure 20 is a partially cutaway bottom plan view of a chair containing the drive mechanism of Figure 12 with the seat in its rearmost and locked position;

Figure 21 is an partially cut away schematic view of the components of the control knob;

Figure 22 is an exploded view of the components of the control knob of Figure 21;

Figure 23 is a cross sectional view of the control knob showing the petals embracing the slip gear; and,

Figure 24 is a cross sectional view of the control knob showing the slip gear slipping through the petals.

DESCRIPTION OF PREFERRED EMBODIMENT

Referring to Figure 1, chair 10 comprises a seat adjustment mechanism 12, a support member 14, a seat 16, a back rest 18, arms 20 and tilt mechanism 22.

Chair 10 may be a seating unit of any general type, shape or configuration. As shown in the preferred embodiment, chair 10 is an office chair or a task chair where a person may be seated for an extended period of time while working.

Support member 14 may be any support member for supporting seat 16 at an elevated height. Preferably, support member 14 comprises a longitudinally extending cylinder 24 (which, more preferably, is a pneumatic cylinder) having a wheeled base 26.

Chair 10 may have a back rest 18. Back rest 18 may be of any shape or configuration known in the art. Preferably, back rest 18 is mounted to support member 14 or, as shown in Figure 1, to tilt

mechanism 22 by any means known in the art, such as by means of a curved bracket 28 which is attached by, eg. screws, to the bottom surface of tilt mechanism 22. More preferably, back rest 18 is mounted to tilt mechanism 22. By connecting back rest 18 to a portion of the chair beneath seat adjustment mechanism 12, the position of back rest 18 is affixed to a portion of chair 10 which will remain stationary while the position of seat 16 is adjusted. Therefore, seat 16 may be moved forwardly or rearwardly with respect to back rest 18 by means of seat adjustment mechanism 12. It will be appreciated that bracket 28 may also be affixed to the portion of the seat adjustment mechanism 12 which remains fixed in position with respect to tilt mechanism 22. It will also be appreciated that back rest 18 may have independent controls to adjust, eg., its position with respect to support member 14, its height or its inclination.

In a preferred embodiment, chair 10 is also provided with arms 20. Arms 20 may be transversely spaced apart on each side of seat 16. Each arm 20 may be affixed to chair 10 via a bracket 30. Arms 20 may be mounted to chair 10 so as to move with seat 16, in which case bracket 30 may be affixed to the portion of seat adjustment mechanism 12 which moves with seat 16. For example, as shown in Figure 11, seat adjustment mechanism 12 may have an upper surface 32 which is provided with a recess 34 which is sized and adapted to receive therein, and have affixed thereto, the lower portion of bracket 30. Thus, each arm 20 may be affixed to the portion of the seat adjustment mechanism 12 which is stationary with respect to seat 16. Alternately, the lower portion of bracket 30 may be affixed to support member 14, tilt mechanism 22 or the portion of seat adjustment mechanism 12 which is fixed in position with respect to tilt mechanism 22 so that as seat 16 is moved forwardly and rearwardly, the position of arms 20 with respect seat 16 varies.

In one preferred embodiment, seat adjustment

mechanism 12 is positioned between support member 14 and seat 16. Preferably, as is known in the art and as is shown in Figure 1, support member 14 is mounted to a tilt mechanism 22 which may be any mechanism known in the art which will permit seat 16 to rock forwardly or rearwardly. Such tilt/control mechanisms are known in the art and all such mechanisms may be incorporated into chair 10. It will be appreciated that if a tilt mechanism 22 were not provided, support member 14 may be connected directly to seat adjustment mechanism 12 in the same manner as is described for affixing tilt mechanism 22 to seat adjustment mechanism 12.

Seat adjustment mechanism 12 comprises a housing 40 and slide member 42. Housing 40 has a frontward end 36, a rearward end 38 and a cavity for slidable receiving slide member 42. Housing 40 may be of any particular shape and configuration and is preferably of a compact shape which may be unobtrusively positioned beneath seat 16.

Slide member 42 is mounted in housing 40 for longitudinal movement forwardly and rearwardly with respect to housing 40. Further, slide member 42 is mounted in housing 40 so as to be fixed transversely in position with respect to housing 40. Accordingly, as slide member 42 moves longitudinally forwardly or rearwardly with respect to housing 40, it will not move transversely side to side. Seat adjustment mechanism 12 also has an adjustment member 44 mounted in housing 40 is provided and drivingly connected to slide member 42.

In order to assemble seat adjustment mechanism 12, housing 44 is provided with an access port so that adjustment member 44 and slide member 42 may be mounted therein. Accordingly, as shown in the preferred embodiment, housing 40 comprises seat support 46 and cover plate 48. Pursuant to this construction, seat support 46, when viewed from the bottom in plan view as shown in

Figure 5, has a cavity 50 for receiving slide member 42 (see Figure 6).

Preferably, cover plate 48 is releasably secured to seat support 46.

Housing 40 is configured so that slide member 42 is fixed in position in cavity 50 to slide along tracks which are provided in housing 40. In the preferred embodiment seat support 46 and cover plate 48 are configured so that slide member 42 is sandwiched therebetween to vertically fix slide member 42 in position.

Accordingly, as shown in Figures 5 and 6, seat support 46 has a bottom surface 52 and a shelf 54 positioned inward thereof to provide an abutment surface on which cover plate 48 may be seated. Shelf 54 is recessed inwardly into seat support 46. Vertically extending side walls 56 extend from bottom surface 52 to shelf 54. Cavity 50 has an inner surface 70 which is recessed with respect to shelf 54. Vertically extending side walls 72 extend from shelf 54 to inner surface 70. The height of vertically extending side walls 72 and vertically extending side walls 56 are selected such that, when slide member 42 is positioned in cavity 50 and cover plate 48 is secured on shelf 54, slide member 42 may move forwardly and rearwardly in cavity 50 with respect to housing 40.

Cover plate 48 may be secured, and preferably releasably secured, in position on shelf 54 by any means known in the art, such as by means of screws (not shown). Accordingly, cover plate 48 may be provided with screw holes 58 and shelf 54 may be provided with mating screw holes 60. Thus, when cover plate 48 is positioned on shelf 54 such that screw holes 58 and 60 align, and screws, or the like, are inserted through screw holes 58 into screw holes 60, cover plate 48 is removably secured to seat support 46 with a cavity 50 extending therebetween.

To mount slide member 42 in housing 40 so that slide member 42 is fixed transversely in position with respect to housing 40,

housing 40 may be provided with a path in which slide member 42 moves longitudinally yet restrains transverse side to side motion of slide member 42. For example, the transverse distance between side walls 72 may be slightly larger than the transverse width between side walls 68 of slide member 42 to permit slide member 42 to move longitudinally with respect to side walls 72 but to prevent transverse motion of slide member 42 with respect to housing 40. Alternately, or in addition, housing 40 may be provided with tracks which may have side walls which engage elements of slide member 42 thus preventing transverse motion of slide member 42 with respect to housing 40.

Referring to the drawings, in the preferred embodiment, slide member 42 comprises a plate 74 having a forward end 76 and a rearward end 78. Plate 74 is provided with a plurality of slide elements along side walls 68 which enable slide member 42 to slide or glide longitudinally within cavity 50. Referring to Figures 8 and 10, slide member 42 may have a plurality of forward slide elements 80 and a plurality of rearward slide elements 82. Preferably, slide member 42 is provided with two forward slide elements 80 which are positioned on opposed transverse sides of plate 74 and two rearward slide elements 82 which are positioned on opposed transverse sides of plate 74. Thus, plate 74 is provided with a pair of forward and rearward slide elements 80 and 82 on each transverse opposed side of plate 74. Plate 74 preferably comprises an integral member which is made from a rigid member such as steel or which may also be made from plastic. Slide elements 80 and 82 may be formed integrally as part of plate 74 or they may be affixed to plate 74 by any means known in the art.

In the preferred embodiment, inner surface 70 is provided with a plurality of grooves 84 for receiving slide elements 80 and 82. Similarly, cover plate 48 is provided with a plurality of grooves 86 which are spaced from, but aligned with grooves 84 of inner surface 70. Accordingly, a pair of groves 84 and 86 is provided for each slide

element 80 and 82. Grooves 84 and 86 may be recessed surfaces which have side walls that define a track for slide elements 80, 82. Alternately, grooves 84 and 86 may be on raised platforms which are mounted to inner surface 70 and the inner surface of cover plate 48. Preferably, as shown in Figure 7, grooves 84 and 86 are openings having side walls 88 in inner surface 70 and cover plate 48 through which slide elements 80 and 82 partially extend. Thus, side walls 88 of grooves 84 and 86 provide abutment surfaces which prevent transverse motion of slide member 42 with respect to housing 40.

As will be appreciated, housing 40 has a pair of rearwardly positioned grooves 84, 86 for receiving rearward slide elements 82 and a pair of forward grooves 84, 86 for receiving forward slide elements 80. Each groove 84, 86 has a rearward end 90 and a forward end 92. Preferably, the longitudinal distance between rearward end 90 of the rearward grooves and rearward end 90 of the forward grooves is the same as the longitudinal distance between forward slide elements 80 and rearward slide elements 82. Accordingly, when slide member 42 is in the rearward position in housing 40, each slide element 80, 82 is adjacent the rearward end 90 of the respective grooves 84, 86. Similarly, when slide element 42 is at its forward position in housing 40, each slide element 80, 82 is adjacent forward end 92 of the respective grooves 84, 86.

As will be appreciated, slide member 42 is fixedly mounted to one of seat 16 and tilt mechanism 22. Accordingly, housing 40 is mounted to the other of seat 16 and tilt mechanism 22. As shown in Figure 1, tilt mechanism 22 is fixedly mounted to slide member 42 by means of screws 94. In particular, as shown in Figures 6 and 10, each slide element 80, 82 may be provided with a screw hole 96 for receiving a screw 94. It will be appreciated that tilt mechanism 22, or alternately support member 14, may be affixed to slide member 42 by any other securing means known in the art.

Similarly, housing 40 may be affixed to seat 16 by any means known in the art. Preferably, seat 46 is affixed to seat support 16. In the preferred embodiment, seat support 46 is provided with a plurality of arms 98, preferably one at each corner of seat support 46 which extends outwardly and upwardly. The upper extension of each arm 98 is provided with an opening 100 through which a fastener, such as a screw or the like, may be inserted to affix seat 16 to arms 98.

In an alternate embodiment, as shown in Figure 11, each arm 98 may have a pod 102 provided at the end thereof. Pod 102 is adapted to receive a spacer 104. Each spacer 104 has an upper portion 108 and a lower portion 106. Spacer 104 may be affixed to pod 102 by any means known in the art. For example, spacer 104 may be provided with a central opening therethrough which is provided for receiving a fastener (such as a screw or the like). Thus, a screw may be inserted through upper portion 108, through lower portion 106, to be received in pod 102 to thereby affix spacer 104 to pod 102.

Preferably, upper portion 108 has a bulbus portion 110 positioned above a narrower neck 112. The lower surface of seat 16 is provided with a plurality of openings, each to receive an upper portion 108 of a spacer 104 (not shown). The opening in the bottom of seat 16 is preferably sized to be smaller than the diameter of bulbus portion 110. Further, bulbus portion 110 preferably is deformable so that it deforms when it is inserted into the opening in the bottom of seat 16. More preferably, the opening in the bottom of seat 16 has a first portion that is narrow and a second, inwardly positioned portion that is wider so as to allow bulbus portion 110 to expand at least partially therein. Thus, seat 16 may be removably affixed to arms 98 by aligning the openings in the bottom of seat 16 with each spacer 104 and pressing downwardly so as to force each bulbus portion 110 to compress and enter into the respective opening, thus snapping seat 16 onto arms 98. By applying suitable upward pressure on seat 16, seat 16 may be

removed from spacers 104.

It will be appreciated with slide member 42 affixed to tilt mechanism 22 and being movable within housing 40, and with seat 16 mounted to housing 40, seat 16 may move longitudinally (i.e. rearwardly or forwardly) with respect to tilt mechanism 22. Further, by affixing back rest 18 to tilt mechanism 22, as shown in Figure 1, the position of seat 16 may be moved longitudinally with respect to back rest 18. Since the actual shape of the lower back and upper leg portion of a person varies from individual to individual, the user may adjust the position of seat 16 with respect to back rest 18 to locate an optimal position of seat 16.

In order to assist a person to incrementally adjust the position of seat 16 with respect to back rest 18, and to maintain the respective positions of seat 16 and back rest 18, the chair is provided with adjustment member 44 mounted in housing 40 and drivingly connected to slide member 42 whereby movement of adjustment member 44 in a first direction causes seat 16 to move forwardly and movement of adjustment member 44 in the opposite direction causes seat 16 to move rearwardly. Preferably, adjustment member 44 is rotatably mounted on housing 40 so that the clockwise rotation of adjustment member 44 will move seat 16 in a first longitudinal direction and the counterclockwise location of adjustment member 44 will cause seat 16 to move in the opposite longitudinal direction.

As shown in the drawings, the adjustment member may comprise rack and pinion drive members. In particular, in the preferred embodiment, adjustment member 44 comprises a longitudinally extending shaft 120 which has a control knob 122 positioned at one end thereof and at least one pinion 124 provided adjacent the distal end thereof. Shaft 120 is rotatably mounted in housing 40, for example, by means of upper bearing mount 126 having an upper bearing surface 128 and lower bearing mount 130 having the

BEST AVAILABLE COPY

lower bearing surface 132. When cover plate 48 is mounted to seat support 46, each upper bearing mount 126 is aligned with a respective lower bearing mount 130 such that upper and lower bearing surfaces 128 and 132 provide a support surface along which shaft 120 may rotate.

Plate 74 is provided with a toothed section which is positioned to engage pinions 124. Accordingly, plate 74 may be provided with a rack which is positioned to align with each pinion 124. As shown in Figure 8, plate 74 has two tongues 134 each of which is provided with a plurality of teeth 136 which are sized and configured to engage the teeth of a respective pinion 124. In order to accommodate pinions 124 in cavity 50, inner surface 70 may be provided with a recessed portion 138 in which upper bearing mounts 126 are affixed. Thus, when slide member 42 is positioned in cavity 50 with slide elements 80, 82 positioned in grooves 84 and 86, tongues 134 will overlay pinons 124. Further, when cover plate 48 is affixed to seat support 46, rotation of control knob 122 will cause pinions 124 to drive plate 74 either forwardly or rearwardly.

In order to prevent accidental adjustment of seat adjustment mechanism 12, seat adjustment mechanism 12 may also be provided with a lock mechanism which has a locked position in which adjustment member 44 is fixed in position and an unlocked position in which adjustment member 44 may be moved to adjust the position of seat 16. Preferably, the locking mechanism comprises a biasing member to bias the locking member to the locked position. The locking mechanism may comprise a first engagement member which is connected to housing 40 and a second engagement member connect to shaft 120 whereby engagement of the first and the second engagement members prevents adjustment member 44 from being rotated.

Referring to the drawings, adjustment member 44 is

provided with biasing member 140. Biasing member 140 may be a spring, a deformable member (eg. rubber), a resilient member (eg. a thin plastic or steel member which may function as a leaf spring) or the like. Biasing member 140 is affixed to shaft 120 by any means known in the art. For example, if biasing member 140 is a spring, shaft 120 may have a washer 142 or the like affixed thereto and biasing member 140 is preferably a member which may be resiliently withstand a compressive force, such as a spring. Accordingly, when adjustment member 44 is mounted in housing 40, the spring or the like is compressed between washer 142 and one of the upper bearing mounts 126. The compressive force of the spring causes washer 142, and therefore shaft 120 and knob 122 to move to the transverse outward position with respect to housing 40. As shown in Figures 5 and 6, an inward force has been applied via control knob 122 to move shaft 120, and therefore pinions 124, transversely inwardly with respect to housing 40.

Cover plate 48 is provided with an abutment member 144 which is positioned and configured to engage a portion of one of the pinions 124 when adjustment member 44 is in the locked position and to be disengaged from pinions 124 when adjustment member 44 is in the unlocked position (as shown in Figure 5). Preferably, abutment member 144 has a toothed inner surface 146 (see Figure 3) in which the teeth of pinions 124 may be engaged. It will be apparent that abutment member 144 may be provided on inner surface 70.

Referring to Figure 6, slide member 42 is shown mounted in seat support 46 with cover plate 48 removed. Tongues 134 extend forwardly over shaft 120. In the unlocked position shown in Figure 6, tongues 134 are fully aligned with pinions 124 so that pinions 124 are not seen in this bottom plan view. It will be appreciated that if cover plate 48 were affixed to seat support 46, that abutment member 144 would be positioned in the dotted area as shown in Figure 6 adjacent

upper bearing mount 126 and noted as area A. When inward pressure is removed from knob 122, pinions 124 move outwardly such that at least a portion of one of the pinions 124 engages teeth 146 of abutment member 144.

Figure 12 shows an alternate preferred embodiment of the seat slide mechanism. In this preferred embodiment, plate 74 has a single tongue 134 with a set of teeth 136 that engage a single pinion 124 instead of two as shown in Figures 5 and 6. Further, tongue 134 and pinion 124 of this embodiment have a greater transverse extent than tongue 134 and pinion 124 of the embodiment shown in Figures 5 and 6. In addition, pinion 124 is positioned toward the rear of seat 16 as opposed to toward the front as shown in Figure 1. It will be appreciated that pinion 124 and associated control shaft 120 may pass through the wall of seat support 46 at any location. Similarly plate 74 may be configured to accept a pinion on any portion of tongue 134. Similarly slide elements 80, 82 and ends 90, 92 may be configured to restrict movement of plate 74 within a desired range. Shaft 120 in the preferred embodiment is made of metal while pinion 124 and plate 74 are preferably constructed of plastic.

When assembled, pinion 124 resides within recessed portion 138 of seat support 46 and is nonrotatably mounted to shaft 120. For example, pinion 124 has at its end closest to control knob 122 a connecting sleeve 148 which secures it to the shaft 120 (eg. a set screw may be housed in connecting sleeve 148). At the other end of the pinion 124 is a biasing support shaft 150. Biasing support shaft 150 has a biasing ring 152 of slightly larger diameter to ensure that when control knob 122 is pressed inwardly by the user, biasing member 140 (in this case a spring) will be restricted from sliding along biasing support shaft 150 toward the control knob 122. Biasing support shaft 150 reduces in diameter past the biasing ring 152 so that the biasing support shaft 150 is surrounded by the biasing member 140 to ensure

biasing member 140 is concentric to pinion 124.

Biasing member 140 of Figure 12, biases pinion 124 into toothed inner surface 146 of seat support 46. Toothed inner surface 146 is cut from the end wall of recessed portion 138 opposite the biasing means and is sized to accept the teeth of pinion 124. In locked mode, i.e. when no inward force is placed by the user upon shaft 120, a portion of the gears of pinion 124 reside in toothed inner surface 146 and thus shaft 120 cannot be rotated (see Figure 14). Slide member 42 is effectively locked and immovable. However, should the user press inwardly upon control knob 122, biasing ring 152 will be pressed against biasing member 140 and pinion 124 will be released from toothed inner surface 146 (see Figure 15). As long as inward pressure is placed upon the control knob 122, the control knob 122 may be rotated and the slide member 42 adjusted, thus adjusting seat 16.

Referring now to Figure 13, an exploded view of the components of Figure 12 is shown. As described earlier, tilt mechanism 22 is connected to slide member 42 by screws 94. Slide member 42 and pinion 124 are enclosed within the cavity defined by the walls of seat support 46 and the cover plate 48. In this embodiment, shaft 120 passes through the side wall of seat support 46 by way of shaft retaining notch 154. The base of shaft retaining notch 154 contains a retaining groove 156 that is sized to releasably accept shaft 120 so that shaft 120 is free to rotate and slide along its central axis, within retaining groove 156, but will not move transverse to its central axis in use.

Referring now to Figure 17 and 20, a portion of chair 10 is shown partially cut away with the seat 16 in its rearmost position. Shaft 120 may be pushed inward by the user in the direction of arrow A in Figure 16 thus compressing biasing member 140 and freeing pinion 124 from toothed inner surface 146. In this position the user may now rotate control knob 122 in a clockwise or counter-clockwise

(arrow B) direction to cause pinion 124 to engage the teeth 136 of tongue 134, thus moving seat 16 forwards or backwards respectively. For example, the user may rotate control knob 122 until seat 16 in an intermediate position (Figures 18 and 19) in which slide elements 80 and 82 are not quite abutting rearward ends 90 of grooves 86, thus forward movement of the seat 16 is still possible. Further rotation of control knob 122 will cause seat 16 to move to the foremost position in the direction of arrow C (Figure 16 and 20).

In the preferred embodiment of Figures 21 and 22, control knob 122 includes a clutch mechanism to prevent rotation of shaft 120 if a load is applied to shaft 120 which may cause the seat slide mechanism to be damaged (eg. if the load applied is sufficiently strong to strip the teeth of pinion 124 or tongue 134 which, in a preferred embodiment, are made of plastic). Accordingly, if the user attempts to rotate control knob 122 while pinion 124 is in a locked position, i.e. a portion of pinion 124 is contained within toothed inner surface 146, the control knob 122 will spin freely about shaft 120. The advantage of such a structure is twofold as it prevents a user from potentially damaging pinion 124 and/or toothed inner surface 146 when shaft 120 is in the locked position and it reminds the user that to move the seat 16 the control knob must be pushed inward.

Control knob 122 may comprise base 162, slip gear 168, retaining clip 174, outer sleeve 180 and cap 186. Base 162 may be non-rotatably mounted to shaft 120 by any means known in the art. For example, base 162 may contain a plurality of ribs 163 sized to flexibly grip shaft 120. Shaft 120 has a flat portion 164 at the end engaging control knob 122. Flat portion 164 fits within a corresponding ledge (not shown) of slip gear 168 to ensure that slip gear 168 rotates with shaft 120. Slip gear 168 is retained on shaft 120 by any means known in the art such as retaining clip 174. In addition to preventing rotation of slip gear 168 about shaft 120, flat portion 164 of shaft 120 also provides a

better gripping surface for retaining clip 174 than that provided by a purely cylindrical shaft.

Outer sleeve 180 provides the hand grip for the user and is accordingly drivingly affixed to base 162. Within the inner surface of outer sleeve 180 are a plurality of retaining ribs 183 which engage matching slots 184 (Figure 22) in base 162. This construction ensures outer sleeve 180 will not rotate freely around base 162. Outer sleeve 180 is preferably constructed of a non slippery plastic material that is easily gripped by the user. Outer sleeve 180 may contain a plurality of small projections 181 extending from its exterior surface to improve grip.

Cap 186 may be removably attached to the top of base 162, and may snap on. Preferably cap 186 is attached to base 162 by screws extending through screw holes 184. Retaining ribs 183 within outer sleeve 180 are preferably positioned so that the edge 179 of outer sleeve 180 extends the length of base 162 and also provides a receptacle for cap 186.

Slip gear 168 is mounted in base 162 for rotation with base 162. However, at the same time, under the application of a sufficient force, it is automatically disengagable from base 162 so as not to rotate therewith. Accordingly, the clutch includes a disengagment member to selectively disengage sleeve 180 from shaft 120 when a predetermined force is applied to the adjustment member. The disengagement member may comprise a first engagement member associated with the drive shaft and a second engagement member associated with the control knob, one of the first and second engagement members being biased to engage the other of the first and second engagement members and drivingly rotatably connect the control knob to the drive shaft whereby the first and second engagement members disengage when the predetermined force is applied to permit the control knob to rotate independent of the rotation of the drive shaft.

For example, slip gear 168 (one of the engagement members) may reside snugly within flexible petals 169 of base 162 (the other of the engagement members). Slip gear 168 is preferably slightly conical in shape and contains a plurality of flat planar surfaces 170 each of which is engaged by a petal 169. Petals 169 are arranged concentric with the shaft 120 with an internal diameter of the circle formed by the petals sized to grip flat planar surfaces 170 of skip gear 168. Each petal 169 is separated from the adjacent petals by a notch or gap 171 on each side, thus defining a petal 169. Petals 169 are made from a flexible material (eg metal but preferably plastic) having elastic tendencies so that when flexed, petal 169 will attempt to return to its original position. If slip gear 168 is conical in shape, the insertion of slip gear 168 into base 162 will cause petals 169 to deflect outwardly to engage surfaces 170 thus providing a tight friction fit between the petals 169 and the surfaces 170.

It will be appreciated that slip gear 168 may have an opening into which petals 169 are received and thus the abutment surfaces which are contacted by petals 169 are provided internally of slip gear 169. Thus petals 169 will deflect inwardly when petals 169 slip over the inner surface of slip gear 168. It will also be appreciated that petals 169 may be provided on slip gear 168 and that the abutment surfaces contacted by the petals may be associated with sleeve 180. Further, the engagment members may be surfaces in any particular orientation which will abut each other to hold sleeve 180 in rotational connection with shaft 180 when no load is applied to sleeve 180 and will splip past each other when a predetermined laod is applied. For example, the engagment members may be toothed surfaces that are biased into contact with each other but will allow, when sufficient force is applied, one toothed surface to rotate relative to the other toothed surface.

Referring now to Figure 23, the slip gear 168 is frictionally

secured within the petals 169. If the pinion 124 is in the unlocked position, then shaft 120 will turn freely and slip gear 168 will remain fixed within petals 169 as control knob 122 is rotated by the user. Once the pinion 124 is returned to the locked position, shaft 120 and slip gear 168 remain in a fixed position and cannot be rotated. In this configuration, a user attempting to rotate control knob 122 will find that it merely spins about slip gear 168 without rotating shaft 120 as shown in Figure 24. This will also occur if seat 16 has been moved to its foremost or rearmost position and the user tries to move the seat beyond that position.

Although the number of faces for slip gear 128 and petals are each six, there is no reason that another configuration could not been chosen, the functional point being that a clutch type function is required whereby the control knob 122 rotates freely when the pinion 124 is in a locked position. Thus the automatic clutch override should the user fail to disengage the pinion 124 before attempting to move the seat prevents any possibility of damage to the drive mechanism of the seat.

In use, the user may be seated in a chair. At that time, the user may reach down and take hold of knob 122. By pushing inwardly on knob 122, pinions 124 may be moved inwardly so as to be disengaged from abutment member 144. It will be appreciated that while pinions 124 may partially engage teeth 136 of tongues 134 while still in engagement with abutment member 144, the fact that abutment member 144 is affixed to seat support 46 will prevent the user from being able to rotate control knob 122 and thereby adjust the position of seat 16. By pressing inwardly, pinions 124 are disengaged from abutment member 144 and thus knob 122 may be freely rotated clockwise or counterclockwise to longitudinally displace slide member 42. As slide member 42 is affixed to tilt mechanism 22, this longitudinal displacement will in fact cause seat 16 to move forwardly

or rearwardly.

When the seat is in the desired position, the user merely releases knob 122. Biasing member 140 causes washer 142 to move outwardly until it engages the side of recess 138. This causes pinions 124 (which are non-rotatably affixed to shaft 120) to move to a position whereby they at least partially engage abutment member 144. Thus, by releasing control knob 122, adjustment member 44 automatically moves to the locked position. Accordingly, it will be appreciated that the locking mechanism of the instant invention is easily operable merely by pushing inward on control knob 122 and thereby merely releasing control knob 122. Thus, the position of seat 16 may be adjusted while the user is in fact seated in chair 10 as only one hand is required to operate the seat adjustment mechanism and the locking mechanism.

We Claim:

1. A chair comprising:

(a) a longitudinally extending seat having a centrally positioned longitudinally extending axis defining a centre line;

(b) a support member for supporting the seat at an elevated height;

(c) a slide member fixedly mounted to one of the seat and the support member and having at least one drive portion;

(d) a slide mount positioned between the seat and the support member and fixedly mounted to the other of the seat and the support member, the slide mount slideably receiving the slide member, the slide member mounted for longitudinal movement forward and rearward with respect to the slide mount;

(e) an adjustment member drivingly connected to the at least one drive portion; and,

(f) a disengagment member to selectively disengage the adjustment member from the slide member when a predetermined force is applied to the adjustment member.

2. The chair as claimed in claim 1 wherein the adjustment member comprises a drive shaft having a first end and a second end, the first end having a control knob and the second end drivingly connected to the at least one drive portion.

3. The chair as claimed in claim 2 wherein the control knob is rotatably mounted about the drive shaft and the disengagement member comprises a first engagement member associated with the

drive shaft and a second engagement member associated with the control knob, one of the first and second engagement members being biased to engage the other of the first and second engagement members and drivingly rotatably connect the control knob to the drive shaft whereby the first and second engagement members disengage when the predetermined force is applied to permit the control knob to rotate independent of the rotation of the drive shaft.

4. The chair as claimed in claim 3 wherein one of the first and second engagement members is resiliently deformable to bias it to engage the other of the first and second engagement members.

5. The chair as claimed in claim 4 wherein the first and second engagement members include abutment surfaces and one of the first and second engagement members defines an opening in which the other of the first and second engagement members is received.

6. The chair as claimed in claim 4 wherein the second engagement member comprises a slip member which is non-rotatably mounted on the drive shaft.

7. The chair as claimed in claim 6 wherein the slip member has abutment surfaces provided on its outer surface and the first engagement member comprises a plurality of members which define an opening in which the slip member is received, the plurality of members contacting the abutment surfaces and being deformable outwardly from the opening to permit the control knob to rotate when the predetermined force is applied.

8. The chair as claimed in claim 1 wherein the adjustment

member includes a slideable portion which is moveable between a first position in which movement of the adjustment member adjusts the position of the seat and a second position in which the seat is fixed in position.

9. The chair as claimed in claim 1 further comprising a lock mechanism having a locked position in which the adjustment member is fixed in position and an unlocked position in which the movement of the adjustment member adjusts the position of the seat.

10. The chair as claimed in claim 11 wherein the locking mechanism comprises a biasing member to bias the locking member in the locked position.

11. The chair as claimed in claim 12 wherein the locking mechanism comprises a first engagement member connected to the slide mount and a second engagement member connected to the adjustment member and engagement of the first and second engagement members defines the locked position.

12. A clutch for a chair having a seat slidably mounted on a base and adjustable by an adjustment member drivingly connected to the seat, the clutch comprising:

(a) a drive shaft having a first end and a second end, the second end drivingly connected to the seat;

(b) a control knob positioned on the first end of the drive shaft; and,

(c) a disengagment member to selectively disengage the adjustment member from the seat when a predetermined force is applied to the adjustment member.

13. The clutch as claimed in claim 12 wherein the control knob is rotatably mounted about the drive shaft and the disengagement member comprises a first engagement member associated with the drive shaft and a second engagement member associated with the control knob, one of the first and second engagement members being biased to engage the other of the first and second engagement members and drivingly rotatably connect the control knob to the drive shaft whereby the first and second engagement members disengage when the predetermined force is applied to permit the control knob to rotate independent of the rotation of the drive shaft.

14. The clutch as claimed in claim 13 wherein one of the first and second engagement members is resiliently deformable to bias it to engage the other of the first and second engagement members.

15. The clutch as claimed in claim 14 wherein the first and second engagement members include abutment surfaces and one of the first and second engagement members defines an opening in which the other of the first and second engagement members is received.

16. The clutch as claimed in claim 14 wherein the second engagement member comprises a slip member which is non-rotatably mounted on the drive shaft.

17. The clutch as claimed in claim 16 wherein the slip member has abutment surfaces provided on its outer surface and the first engagement member comprises a plurality of members which define an opening in which the slip member is received, the plurality of members contacting the abutment surfaces and being deformable

outwardly from the opening to permit the control knob to rotate when the predetermined force is applied.

18. The clutch as claimed in claim 12 wherein the adjustment member includes a slideable portion which is moveable between a first position in which movement of the adjustment member adjusts the position of the seat and a second position in which the seat is fixed in position.

19. The clutch as claimed in claim 12 further comprising a lock mechanism having a locked position in which the adjustment member is fixed in position and an unlocked position in which the movement of the adjustment member adjusts the position of the seat.

20. The clutch as claimed in claim 19 wherein the locking mechanism comprises a biasing member to bias the locking member in the locked position.

21. The clutch as claimed in claim 20 wherein the locking mechanism comprises a first engagement member connected to the slide mount and a second engagement member connected to the adjustment member and engagement of the first and second engagement members defines the locked position.

22. A control means for a chair having mechanical means for slidably mounting a seat on a base and mechanical adjustment means drivingly connected to the mechanical means for slidably mounting the seat, the control means comprising:

(a) mechanical drive means operatively connected to the means for slidably mounting the seat;

(b) mechanical control means operatively connected to the

drive means; and,

(c) disengagment means to selectively disengage the control means from the drive means when a predetermined force is applied to the control means.

23. The control means as claimed in claim 22 wherein the disengagement means comprises first and second engagement means at least one of which is moveable from a first poition in which the control means is drivingly connected to the drive means and a second position in which the control means is disengaged from the drive means and biasing means to bias the engagement means into the first position.

24. The control means as claimed in claim 23 wherein one of the engagement means at least partially receives therein the other engagment means.

25. The control means as claimed in claim 22 wherein the drive means comprises a longitudinally extending shaft and the disengagement means comprises a driven member affixed to the shaft and abutment means biased to engage the driven member.

26. The control means as claimed in claim 22 further comprising lock means having a locked position for locking the drive means and an unlocked position in which the movement of the drive means adjusts the position of the seat.

27. The control means as claimed in claim 26 wherein the locking means comprises biasing means to bias the locking means in the locked position.

28. The control means as claimed in claim 27 wherein the drive means is transversly moveable and movement of the drive means in the transverse direction shift the locking means between the locked and unlocked positions.

29. The control means as claimed in claim 27 wherein the locking means comprises first engagement means connected to the mechanical means for slidably mounting the seat and second engagement means connected to the drive means and engagement of the first and second engagement means defines the locked position.

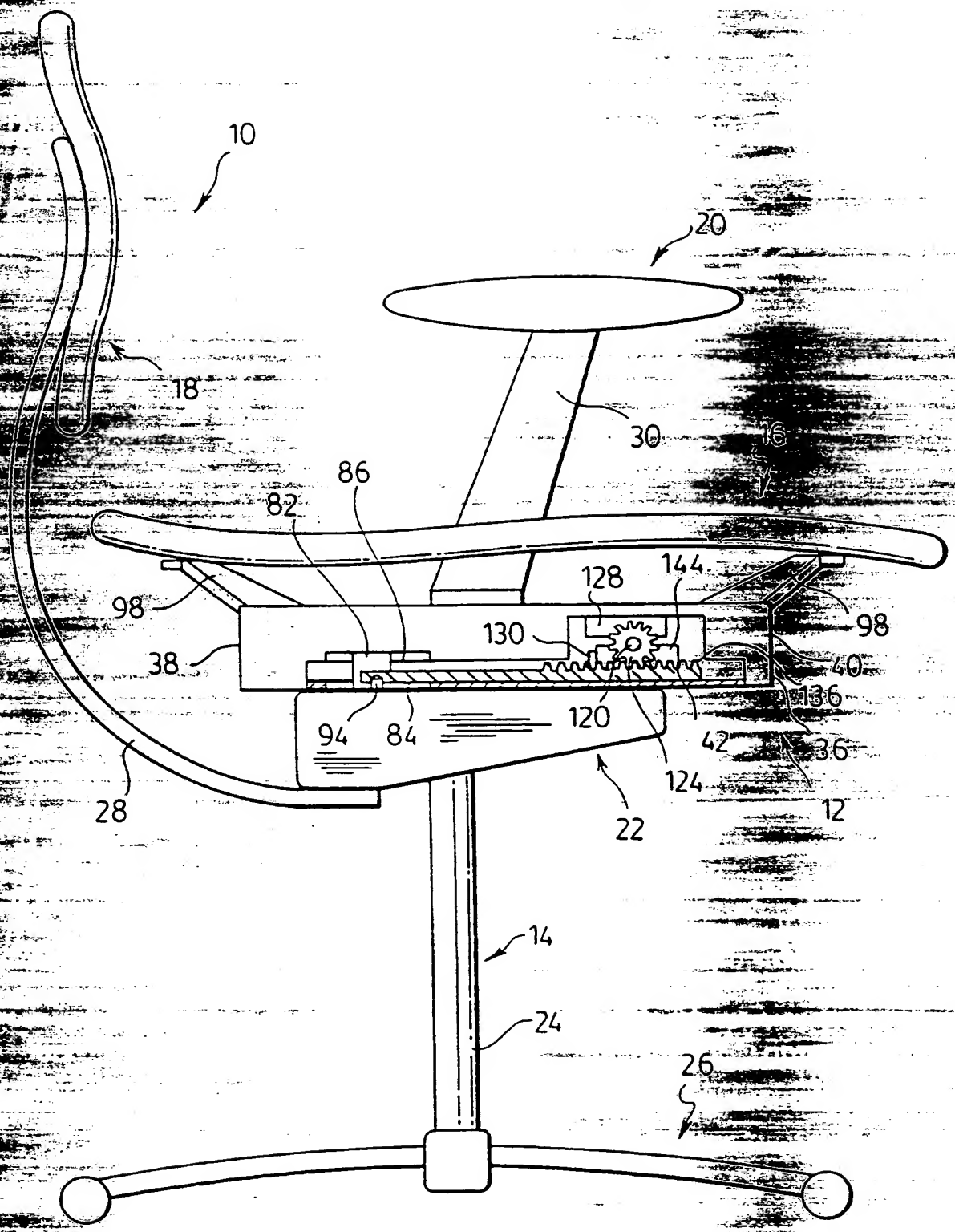

10
20
18
30
16
86
82
128
144
98
130
98
38
40
136
94
84
120
42
36
124
28
22
12
14
24
26

FIG. 1.

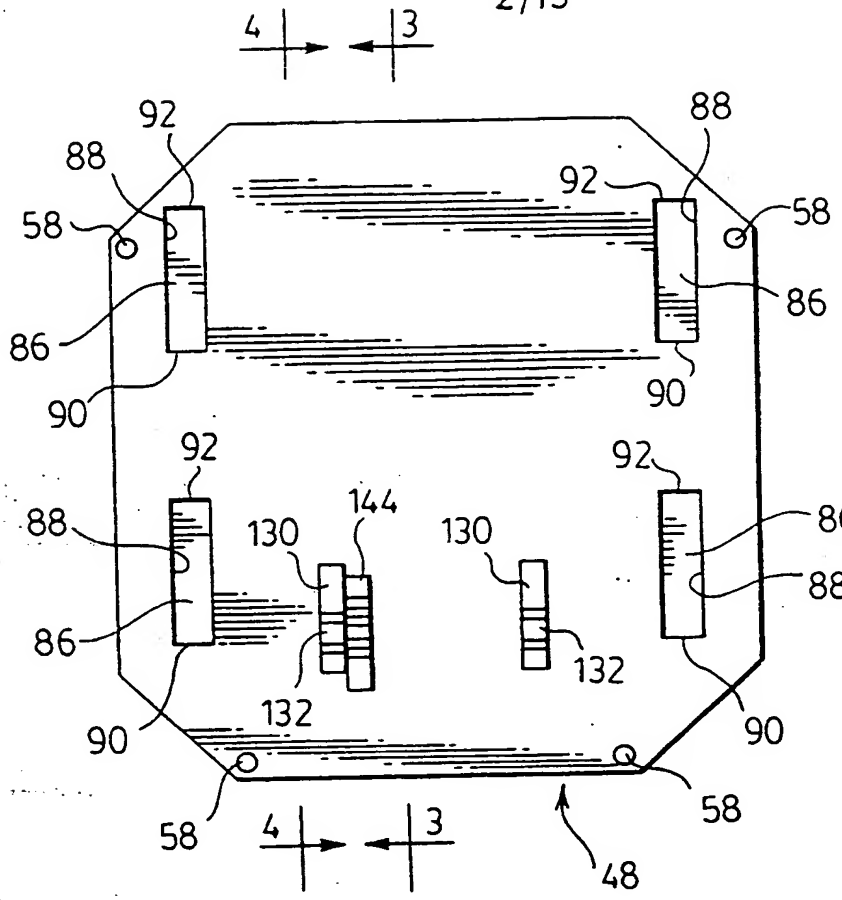


FIG. 2.

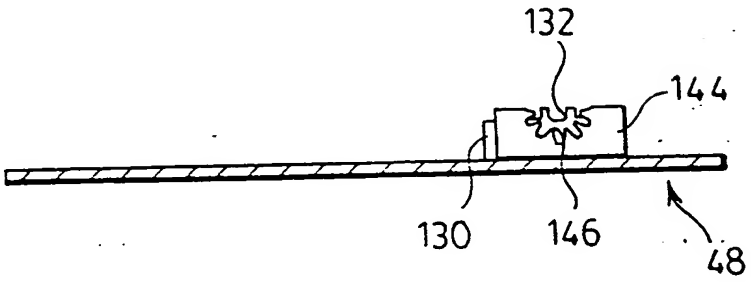


FIG. 3.

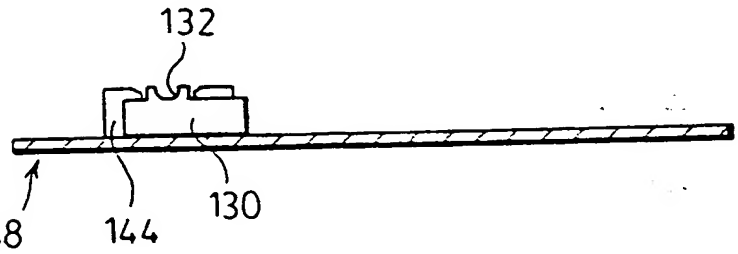


FIG. 4.

FIG. 5.

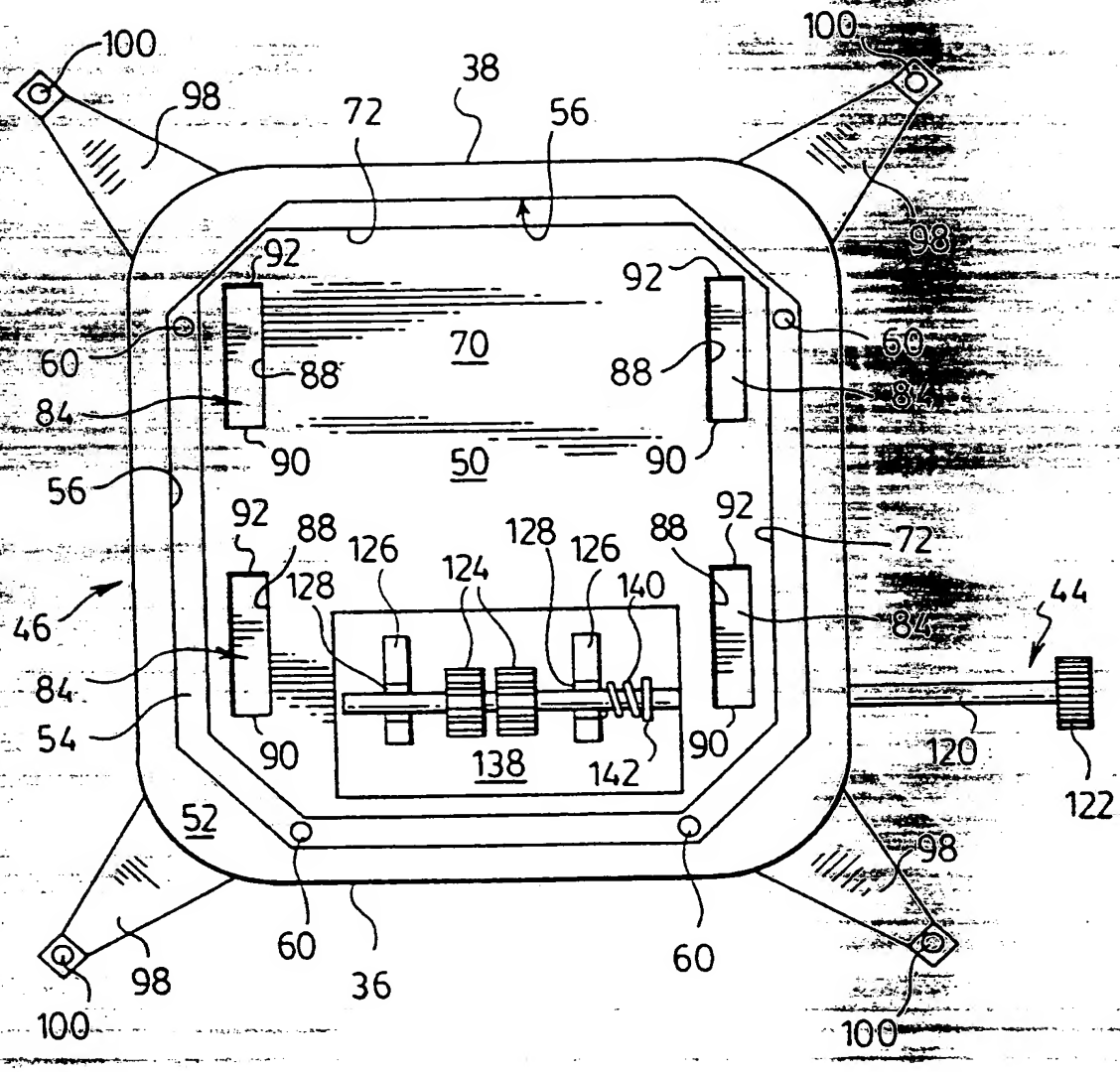

100
98
72
38
56
92
60
88
70
84
90
50
46
54
52
126
124
128
140
138
142
44
120
122
36

FIG. 6.

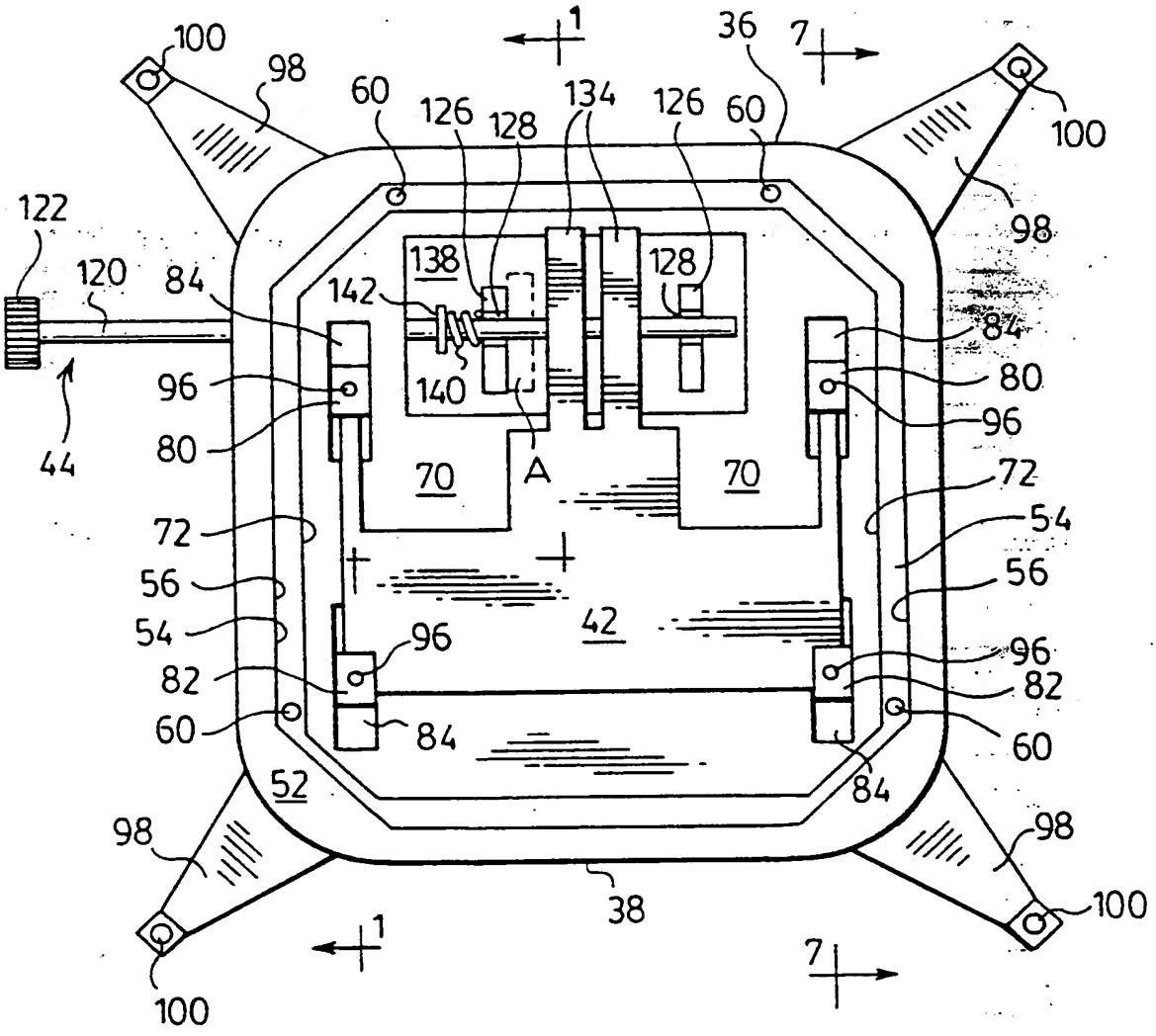

100
98
60
126
128
134
126
60
36
7
1
100
98
122
120
84
138
142
128
84
80
96
140
A
70
70
72
54
56
42
96
82
60
84
52
38
44
96
80
72
56
54
82
60
84
98
100
98
100
1
7

FIG. 7.

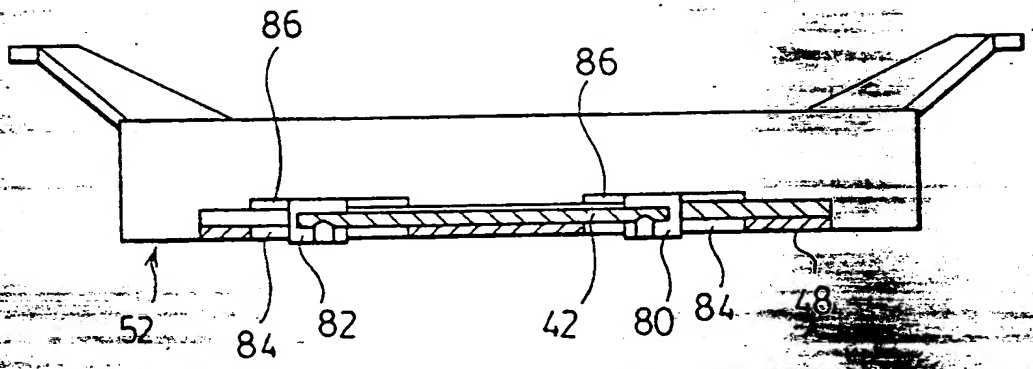


FIG. 8.

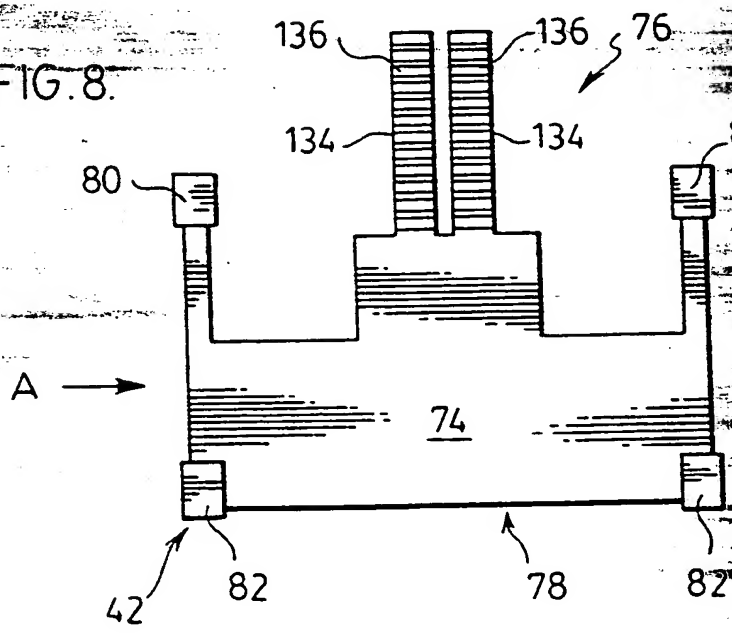


FIG. 9.

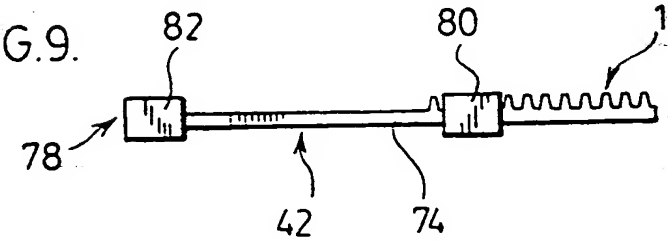


FIG. 10.

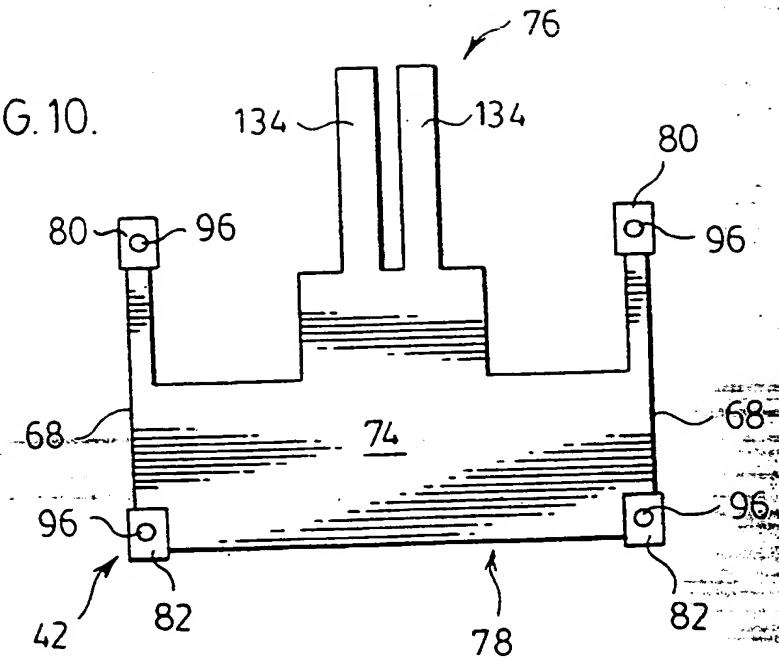

76
134
134
80
80
96
96
68
74
68
96
96
42
82
78
82

FIG. 11.

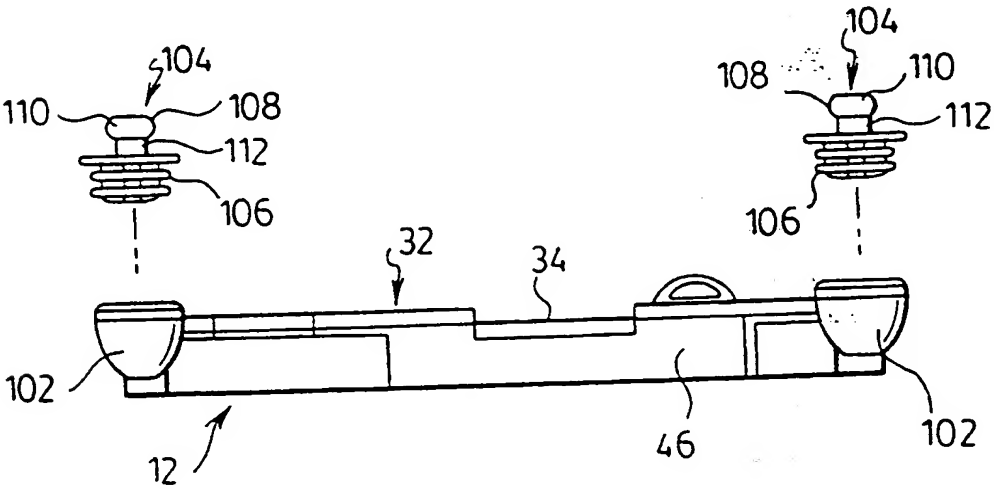
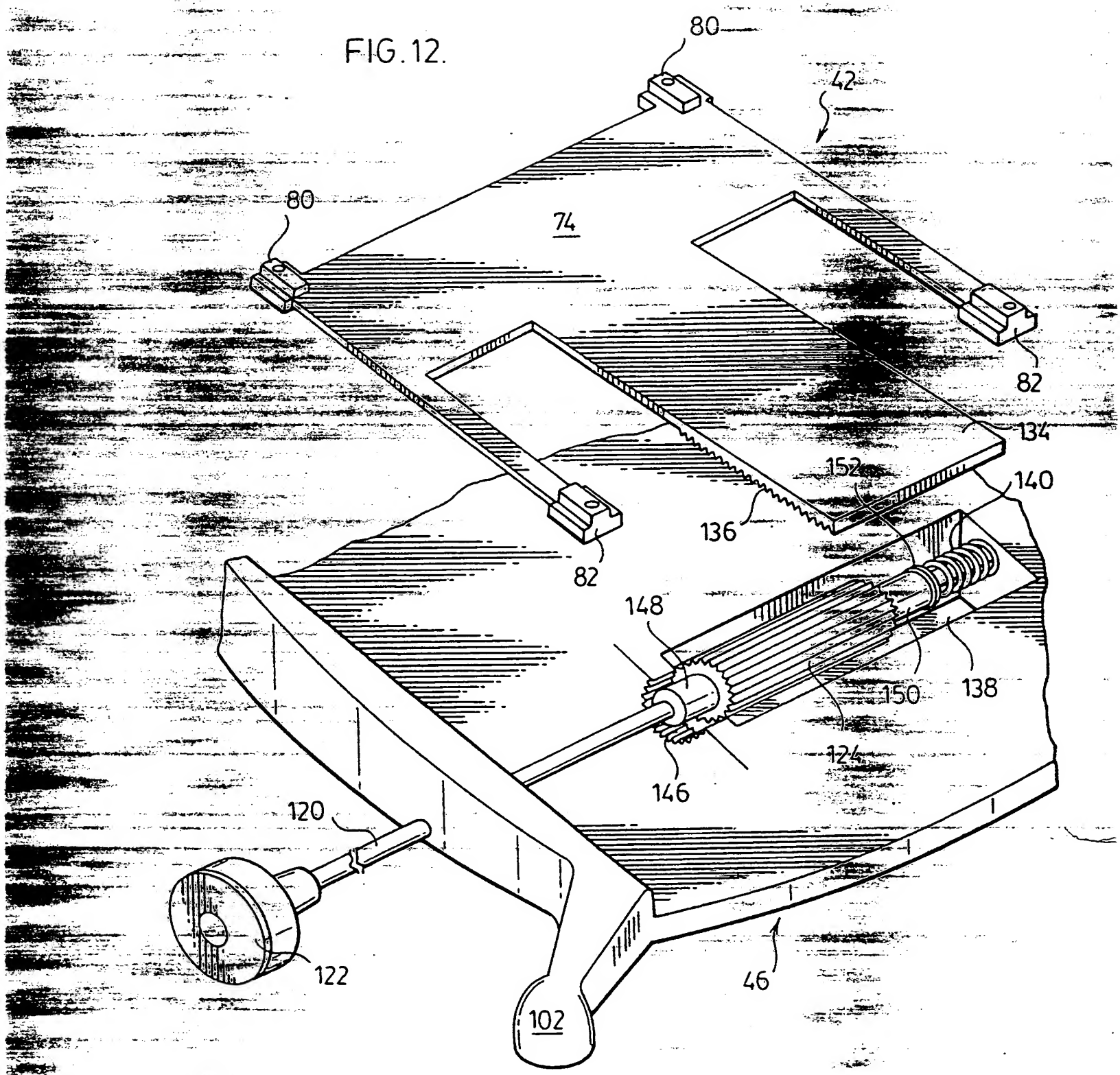

104
110
108
112
106
104
108
110
112
106
32
34
102
12
46
102

FIG. 12.


80
42
80
74
82
134
152
140
136
82
148
150
138
124
146
120
122
46
102

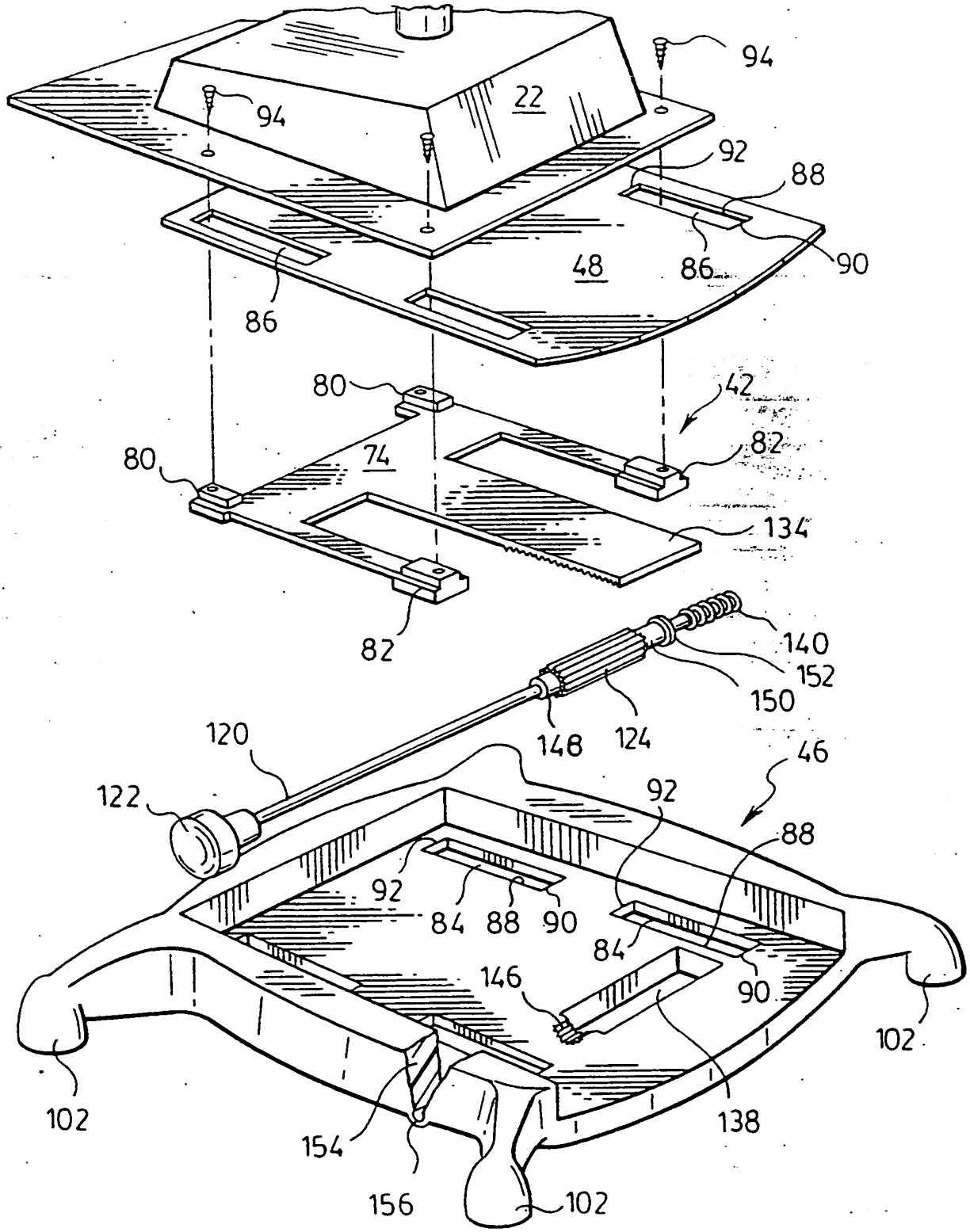

94
94
22
92
88
48
86
90
86
80
42
80
74
82
134
82
140
152
150
148
124
120
46
122
92
88
92
84
88
90
84
146
90
102
102
138
154
156
102

FIG.13.

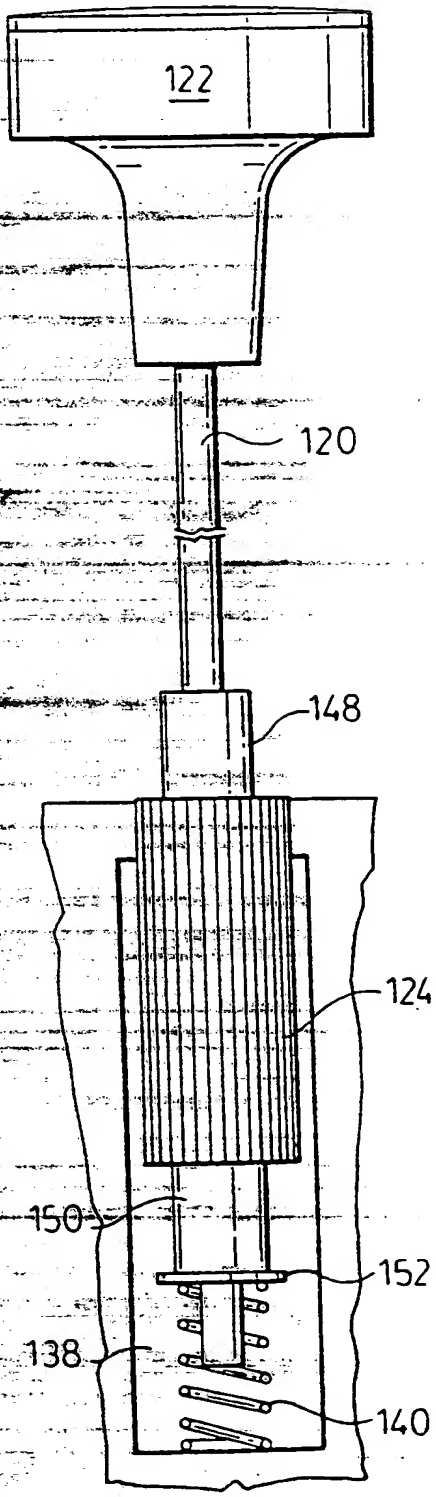

122
120
148
124
150
152
138
140

FIG. 14.

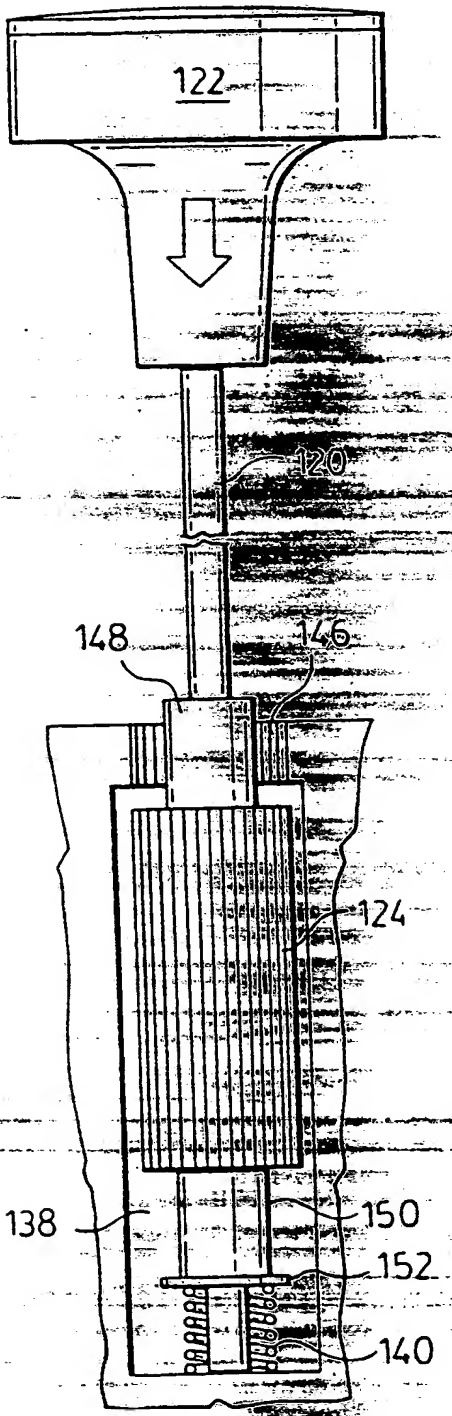

122
120
148
146
124
138
150
152
140

FIG. 15.

FIG.16.

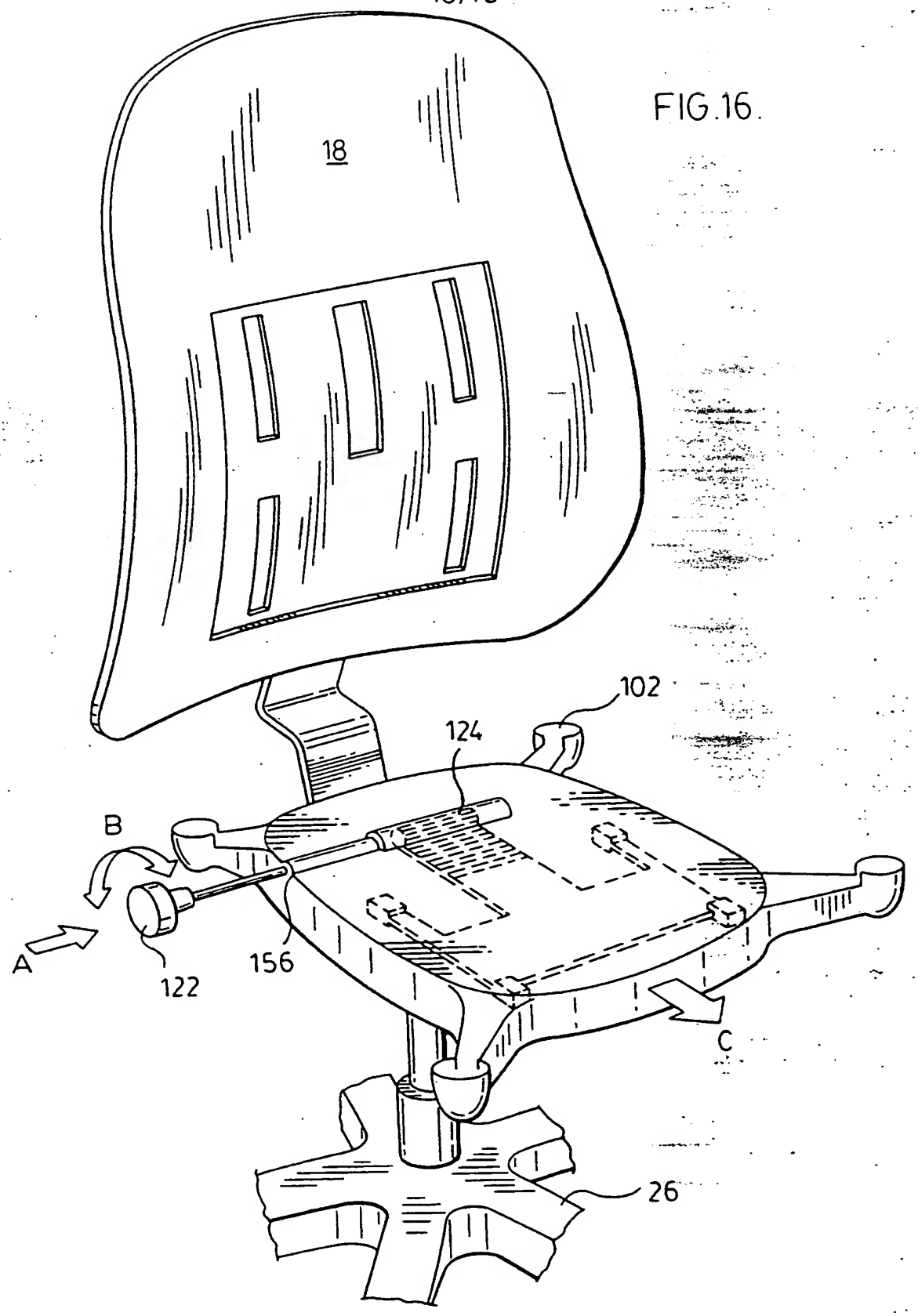


FIG. 17

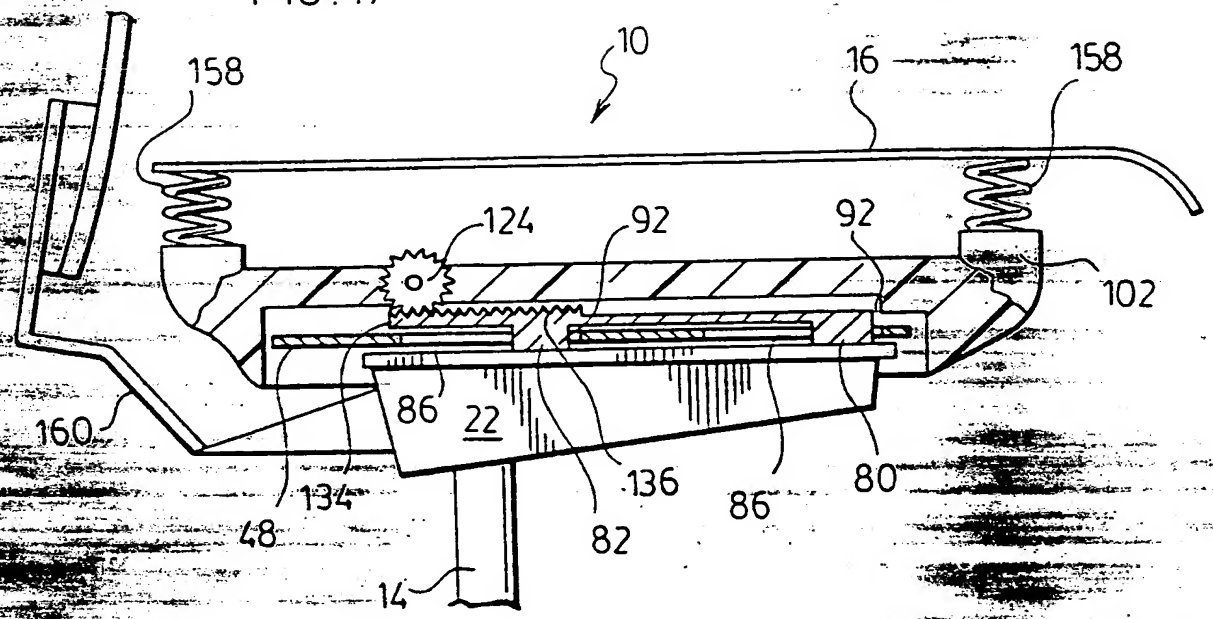

10
158
16
158
124
92
92
102
86
22
160
134
136
86
80
48
82
14

FIG. 18.

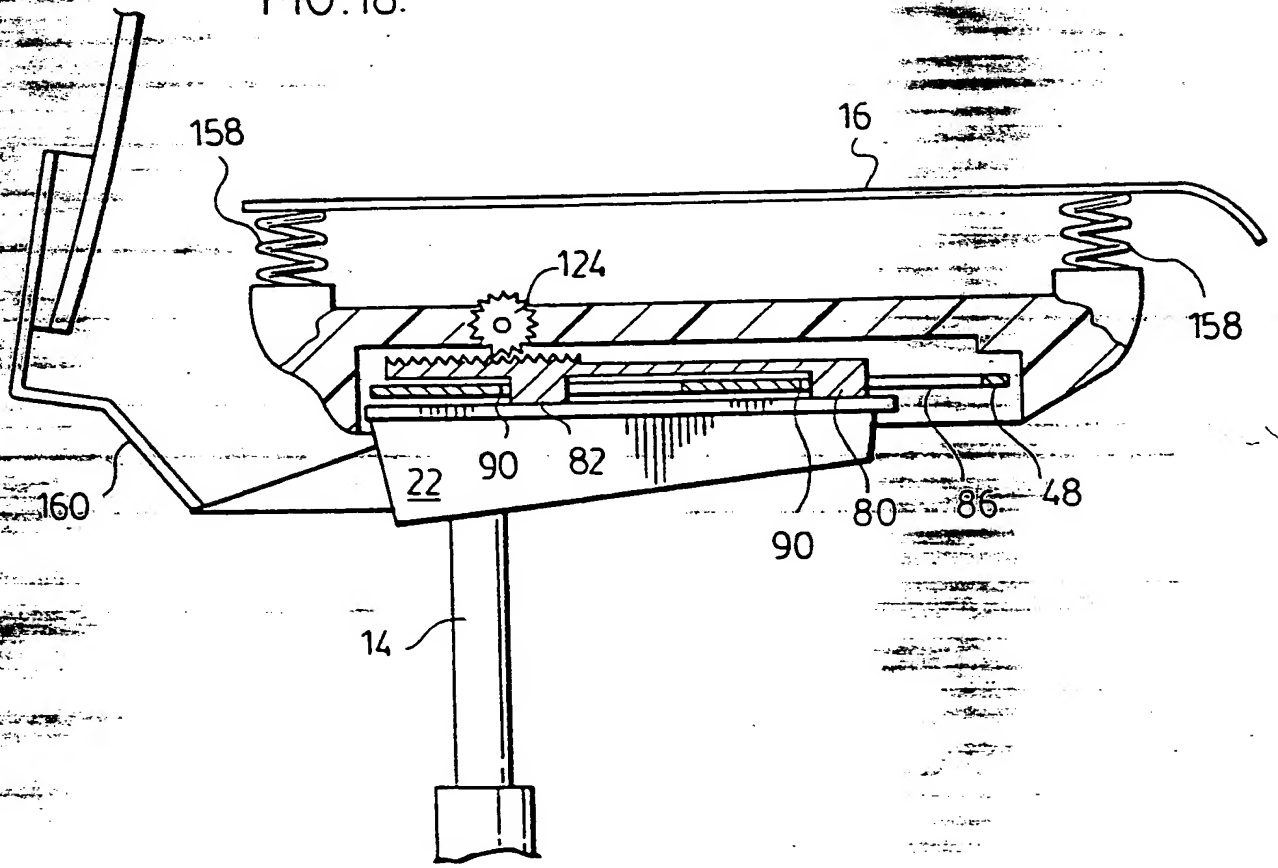

158
16
124
158
22
90
82
160
90
80
86
48
14

FIG. 19.

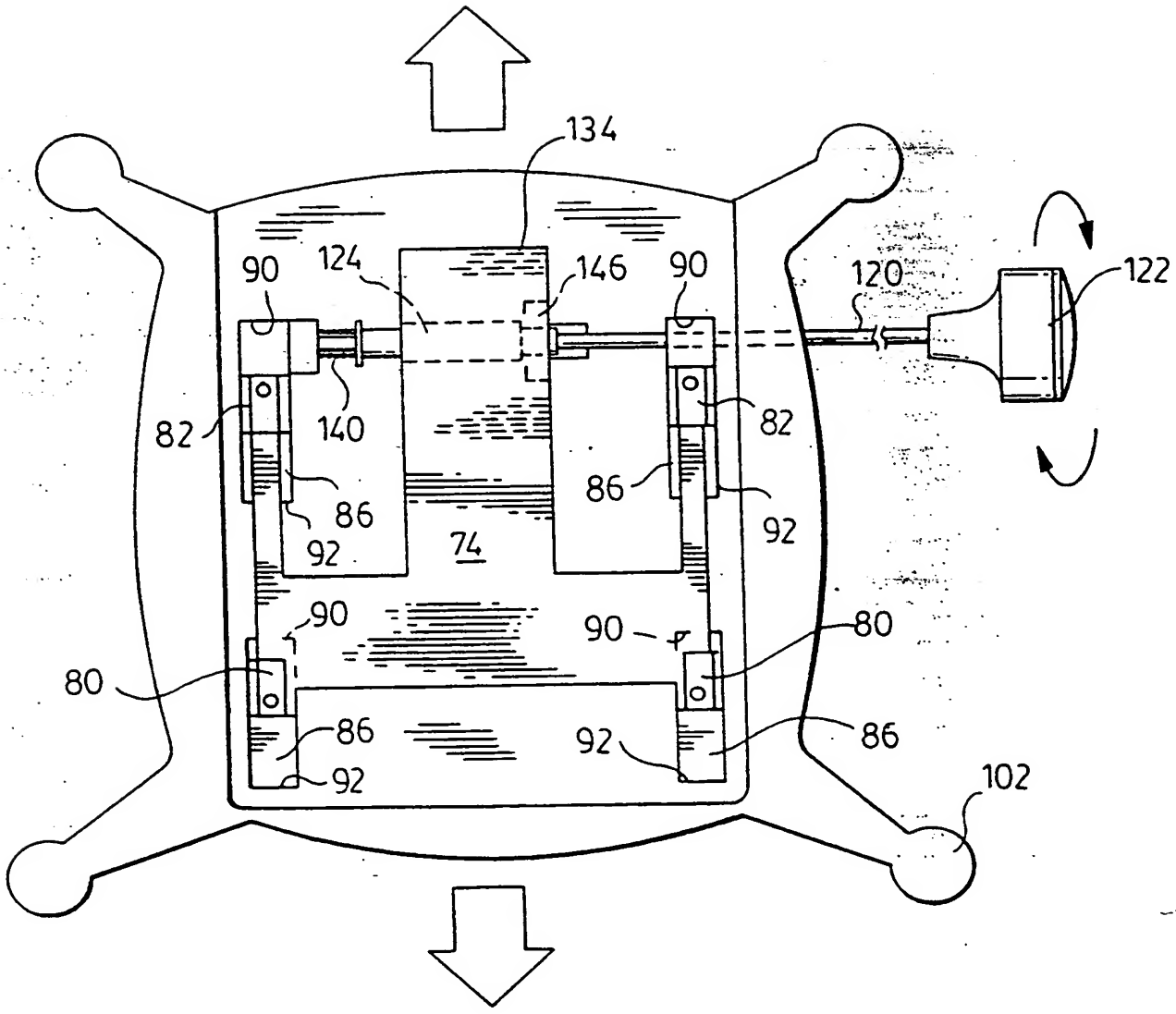
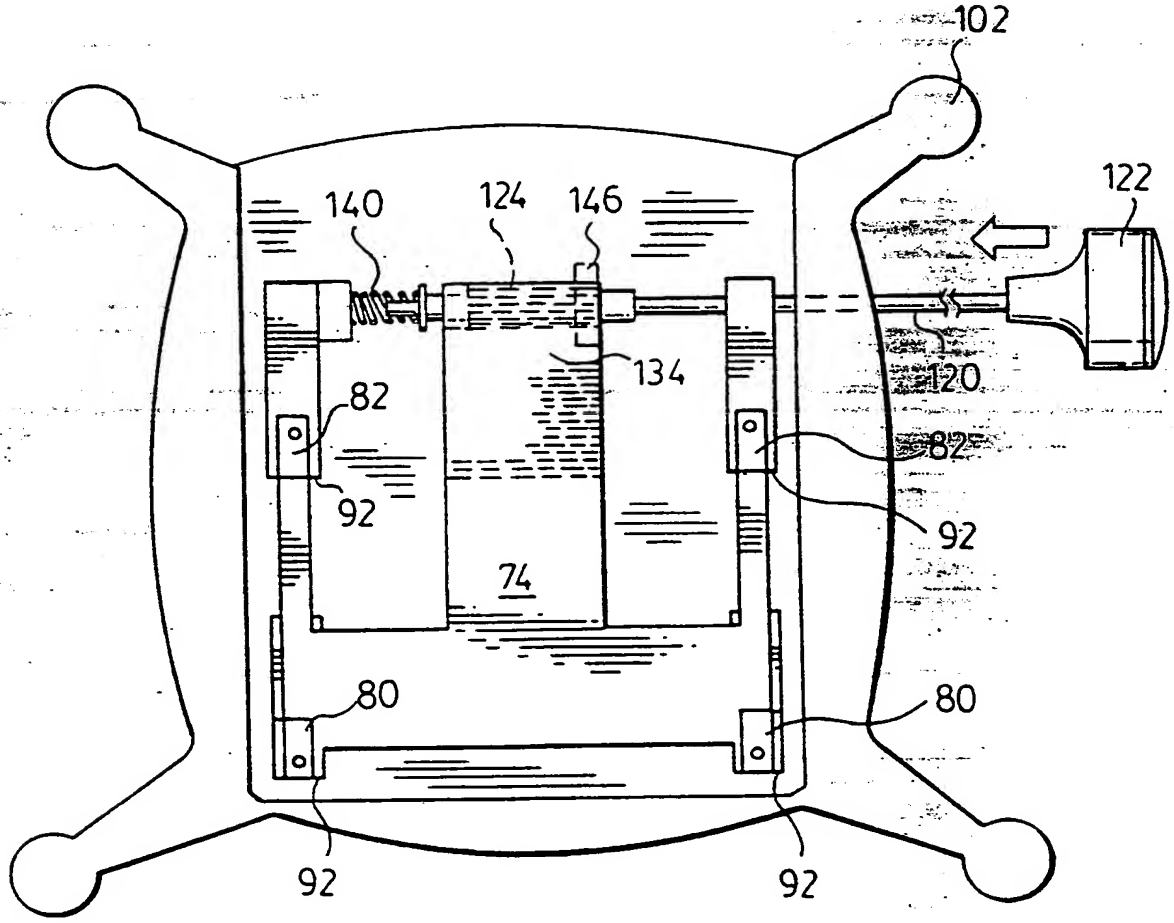

134
90
124
146
90
120
122
82
140
82
86
86
92
92
74
90
90
80
80
86
92
86
92
102

FIG. 20.



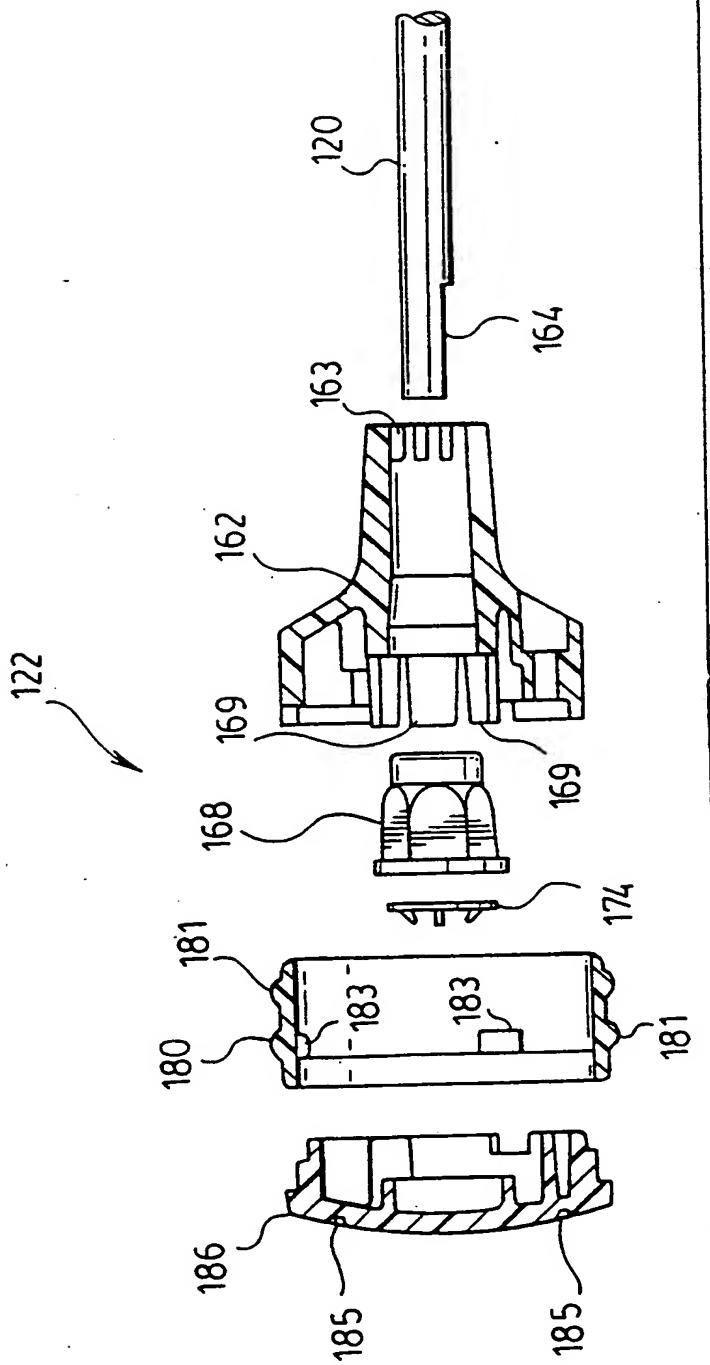

120
164
163
162
122
169
169
168
174
181
183
183
181
180
186
185
185

FIG. 21.

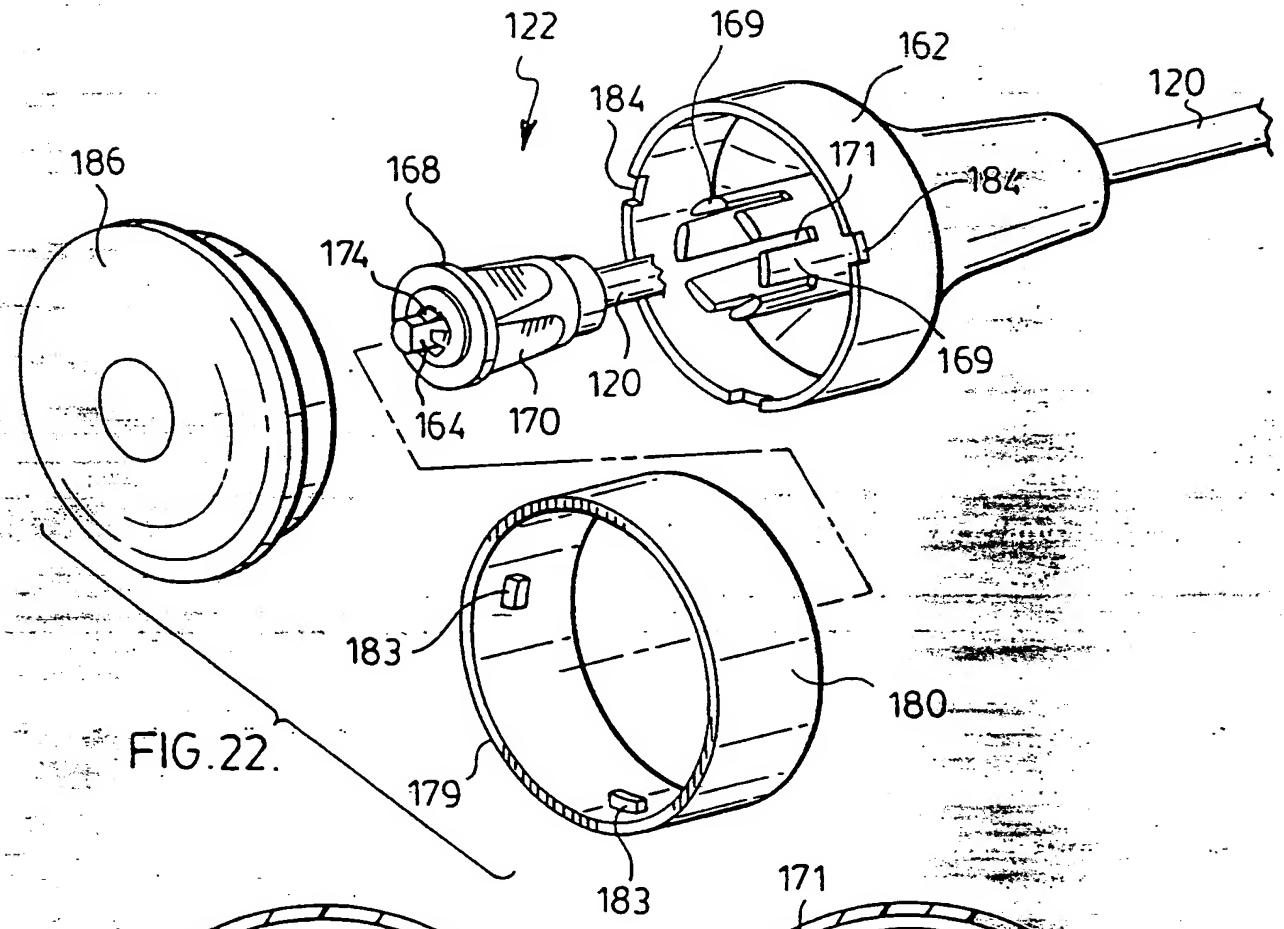


FIG. 22.

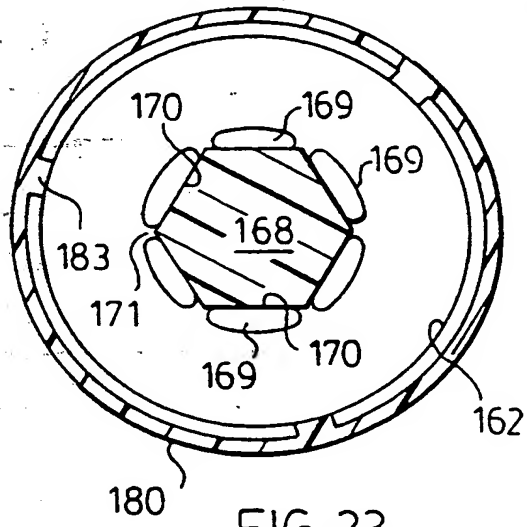


FIG. 23.

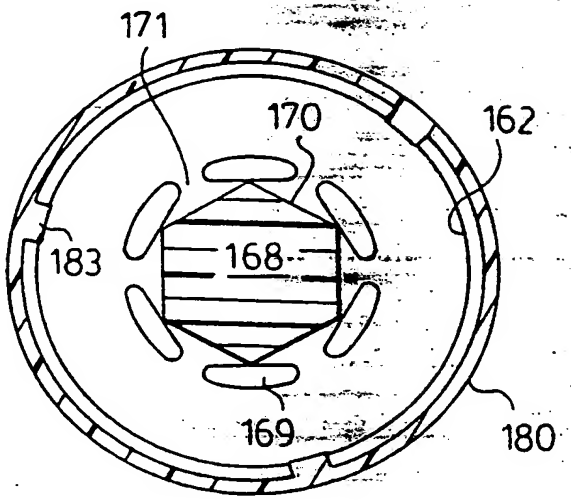


FIG. 24.

INTERNATIONAL SEARCH REPORT

International Application No
PC./CA 99/00492

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A47C1/023

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A47C B60N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 1 693 120 A (RHYNER J) 27 November 1928 (1928-11-27) cited in the application the whole document	1,12,22
A	US 5 035 466 A (MATHEWS MARTY K ET AL) 30 July 1991 (1991-07-30) cited in the application column 3, line 44 - column 4, line 62; figures 3,5B	1,12,22
A	US 4 648 656 A (KIMURA SYUZABURO) 10 March 1987 (1987-03-10) cited in the application the whole document	1,12,22

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
9 September 1999	20/09/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Wehr, W

INTERNATIONAL SEARCH REPORT

formation on patent family members

Inter ional Application No
PC., CA 99/00492

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 1693120 A	27-11-1928	NONE	
US 5035466 A	30-07-1991	CA 1312815 A	19-01-1993
		EP 0466777 A	22-01-1992
		WO 9011707 A	18-10-1990
US 4648656 A	10-03-1987	DE 3425723 A	31-01-1985
		FR 2548982 A	18-01-1985
		GB 2143124 A,B	06-02-1985